CHAPTER 1

Inter-jurisdictional Coordination for Traffic Management

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1. INTRODUCTION

Across the United States, municipal, county and state transportation agencies have set up Traffic Management Centers (TMCs) for highways, roads and transit facilities under their jurisdiction. TMCs perform a range of functions. They most commonly include traffic signal control, incident management, traffic surveillance, special event management, coordination with emergency agencies, and dissemination of information for public and private use. Less frequently, TMC functions incorporate management of weather-related problems, HOV operations, hazardous materials management, ramp metering, and planning for construction diversions.[1]

Many metropolitan areas have installed highly sophisticated systems of computers, traffic sensors, closed-circuit television and communications networks to carry out these functions. Much of the design and construction of these systems has been federally funded under the Intelligent Transportation System (ITS) program. In recent years the capability for real-time management and response to traffic conditions greatly expanded the ability of TMCs to manage traffic effectively.

Because traffic flows across jurisdictional boundaries, it often makes sense to extend the benefits of traffic management by coordinating city, county and state traffic management programs. Inter-jurisdictional coordination takes many forms. Neighboring cities can coordinate signal timings on arterial roads that transverse both jurisdictions, for example, or city and state transportation agencies can coordinate between city arterials or city-operated highways and state highway facilities.

Inter-jurisdictional coordination can be difficult to achieve, however. In fact, institutional issues are often recognized as the most daunting barrier to realization of the potential benefits of coordinating TMC activities. What are the keys to successful coordination? How can institutional and organizational barriers be addressed? This chapter examines these questions with a focus on application to large U.S. cities to assist local and state officials seeking to coordinate their TMC programs.

[1] Kraft (1988) itemizes TMC functions and quantifies the frequency with which each function is currently performed, and will be performed in the future. See references list at end of this chapter.

2. ISSUES

Inter-jurisdictional coordination raises a host of issues and challenges. Discussions with transportation officials at the NACTO-member cities identified the following eleven specific questions or issues of particular interest.

- *What agencies were involved at the start of the TMC inter-jurisdictional process? How were these relationships structured? What was the role of direct inter-agency relationships vs. multi-agency coordinating committees and the like? What were the functions and responsibilities of each agency?*

- *What was shared—information, facilities, equipment, communications networks? What was coordinated—incident response, traffic signal control, variable message signs, emergency response? Why did coordination take the form that it did? What tradeoffs were involved? Would additional benefits be achieved with additional sharing or coordination arrangements?*

- *How was trust built between agencies?*

- *How were control issues addressed?*

- *Why did the agencies participate in this effort? What was the role of need to improve traffic flows? Of a regional vision? Of political forces?*

- *How were the projects funded? How was public, political and institutional support for traffic management systems built?*

- *What were the main costs and benefits of coordination?*

- *What were the catalysts to inter-jurisdictional traffic management? What role did bodies with regional jurisdiction play? Was there a champion who played a critical role? Were funding requirements important? Did the demands of traffic management for special events play a catalytic role?*

- *To what extent was coordination a product of planning processes? What was the nature and extent of the planning processes? Who was involved? To what extent did coordination proceed incrementally? What was the experience with each approach used?*

- *How were issues of compatibility of communications systems, data formats, etc. dealt with? Was this an important issue? At what point was it resolved?*

- *What was the use of private partners, particularly of interest if traffic information has commercial value.*

These eleven issues formed the basis for interviewing during the study team's site visits to Los Angeles, Houston and New York. Each of the eleven issues is addressed individually in the site visit write-ups later in this chapter.

3. LITERATURE REVIEW

Prior to conducting the site visits, the study team collected and reviewed numerous studies that address or touch on institutional issues and inter-jurisdictional cooperation. These studies include reports on TMC operations (JPO 1999; Kraft 1998; Mitretek Systems 1996; Peyrebrune 1996; Urbanik 1998); recommended practices for TMC management and operations (ITE 1995; ITE 1999); the experiences of professionals in the field (Edelman 1997; Wiersig 1997; Wilson 1996; ITS Online 1995;) and a large literature on ITS deployment which increasingly focuses on institutional issues (Volpe 1996; Volpe 1999; Wetherby 1998). Also useful to this discussion are studies of multi-modal transportation programs and partnerships (Crain & Associates 1996; Hauser 1999; Transmanagement, Inc. 1998), an understanding of the changing role of state DOTs (Lockwood 1998), and reports on new regional transportation organizations created for inter-jurisdictional coordination (Briggs 1999).

There is a growing focus on the importance of inter-jurisdictional coordination in traffic management. In a recent study of ITS management and operations, the first recommended practice is to "maintain multi-agency, multijurisdictional, multidisciplinary coordination of management and operation activities." (ITE 1999) A U.S. DOT review of TMC operations in eight cities concluded that future directions for TMCs include integration of freeway and arterial control, and integration of traffic management and transit (JPO 1999)—both of which necessitate inter-jurisdictional coordination. Many jurisdictions have already embarked in this direction. A survey of state highway officials documented growing cross-agency cooperation to facilitate increased state DOT involvement with incident management and emergency response. (Lockwood 1998)

Yet significant hurdles often stand in the way of inter-jurisdictional cooperation. An assessment of ITS program experience across the U.S. concluded that "institutional issues are the main barrier to implementing ITS" in the United States. (Mitretek Systems 1996) Indeed, institutional and inter-jurisdictional issues are at the top of the agenda of transportation officials in the nation's largest cities. (TRB 1999) A recent discussion among city and county government officials highlighted local governments' desire "to more efficiently collaborate and work through issues where traffic goes from arterials to freeways, and vice versa." (Hicks 2000)

These studies speak of obstacles to inter-jurisdictional cooperation, strategies to achieve cooperation, lessons learned and keys to success. The following discussion summarizes key findings from the literature in the context of the eleven issues identified by large-city transportation officials. In the following literature summary, the eleven issues are grouped into five categories below.

FINDINGS ON MAJOR INTER-JURISDICTIONAL ISSUES

1. Types of relationships among agencies, issues of what to share or coordinate and how to build trust.

Studies cited above suggest a range of approaches to structuring inter-jurisdictional relationships. One approach is to establish formal structures such a traffic management committee, a senior policy board or other decision-making body or process. These structures provide a forum to "deal with all activities from planning through operations." (ITE 1999, p. 8) A coordinating body aids "in fostering long-term coordination, cooperation and consensus building, especially in larger metropolitan areas where there are typically numerous involved agencies and organizations." (Kraft 1998, p. 18) Weekly meetings by teleconference can be effective. (Wetherby 1998, p. 27)

Regional management structures are often not created instantaneously but can be developed during a series of projects. "Regional management structures are often achieved through an evolutionary … process … based on the demands of previous interagency projects, existing relationships and the needs of the partners." (Volpe 1999, p. xviii)

Another approach focuses on defining each agency's role. Carefully delineating the roles and responsibilities of each agency avoids confusion about roles that can slow the system development process. (Wetherby 1998, p. 32) Clear definition of roles and responsibilities "enables project managers to assign work to participants that is consistent with their basic missions and allows the project to benefit from the strengths of individual participants." (Volpe 1999, p. xvi) Role clarity is complementary to establishment of formal structures. It may also make such structures less critical if management committees need to give less attention to ironing out agency responsibilities.

A third approach is to encourage and facilitate close relationships between agency staff. This can be achieved through shared facilities ("co-location") and personal relationships. Metropolitan areas that have taken the co-location route emphasize its importance. "Leaders from San Antonio's TransGuide … claim that this daily interaction [at the central management facility] has created new understanding for each other's missions, methods of conducting activities and cultures. They do not believe that the same level of cohesiveness could have been achieved through electronic connections." (Briggs, 1999, p. 41)

Others suggest, however, that today's technology makes shared quarters unnecessary. "Advancing computer, communications and network technologies make it conceivable to effectively coordinate the activities of a number of TMCs located throughout a metropolitan area or geographic region." (Kraft 1998, p. 17) A decentralized approach may be necessary and even desirable. The hub-and-spoke organization of Atlanta-area TMCs, linked by a fiber optic network, was developed because "George DOT personnel felt that the Atlanta region was too large to have an all-encompassing central facility. They

viewed area specialization as advantageous. … [It also allows new Transportation Control Centers] to be added from anywhere in the region or state." (Briggs 1999, p. 41)

Typically, several approaches are utilized in inter-jurisdictional coordination. The combination depends on the particular situation. No one approach fits with every inter-jurisdictional relationship even within a metro area. Each interagency relationship can need a separate strategy tailored to the particular needs of each agency. (Edelman 1997, p. 82)

One of the primary issues raised by staff at large-city transportation agencies is control. Should interagency relationships be confined to sharing information about traffic conditions? Or should there be shared control of video cameras, text on variable message signs, signal timings or other facets of operating the transportation system? Will sharing of information potentially compromise an agency's responsibilities to its constituents or create legal liability for either party should something go wrong?

A second issue raised by central-city staff was identification of a lead agency. Should there be a lead agency? If so, who should take that mantle?

Little of the literature reviewed for this study addresses these two issues, which were more extensively explored in the case studies. An interesting point from one pioneer in inter-jurisdictional coordination, however, was the benefit of having no central authority overseeing inter-jurisdictional coordination. In the New York area, it was the "very lack of centralized authority which creates an environment in which different jurisdictions are willing to cooperate." (Edelman 1997, p. 82)

2. Need, funding, cost, benefits and catalysts.

Large-city transportation officials feel crunched by their current responsibilities. How can they take on the added and often complex tasks of coordinating with neighboring or overlapping governmental authorities? How can they find the time and leadership to reach out to other agencies, find common ground and get inter-jurisdictional coordination set up and underway? How can agencies generate the external political and financial support needed to proceed with these programs?

The studies listed earlier cite a combination of strategies that help move agencies into and through the process of launching and funding inter-jurisdictional coordination. Four inter-related strategies stand out: to focus on visible public needs, identify common interests, find new money for the new tasks, and proceed with a high-level champion.

The importance of focusing on visible public need is a common thread of various case studies. Examples of need are high levels of congestion (Volpe 1996, p. 4) and the need to monitor and manage traffic from special events. (Volpe 1996, p. 14) The perception of need must be shared across agencies. Transportation officials will oppose a freeway or information management system "if they believe such a system would adversely impact local traffic." (Volpe 1996, p. 14) The goals of inter-jurisdictional coordination must "support and [be] consistent with the mission of … member agencies." (Wilson 1996)

Naturally, funding attracts participants. Bringing new money into a metro area not only attracts participation from other agencies, it also wards off resistance that arises when agencies compete for a limited pot of funds.

Participants also attract funding. In San Antonio, Texas DOT found that in bringing the police into TransGuide, the police "not only offered assistance in the core mission of reducing incident response and clearance times, but also an ally and powerful advocate in the competition for resources for additional ITS deployments." (SAIC 2000a)

Finally, some studies note the importance of high-level "champions" who commit themselves and their agencies to moving forward and persevere until inter-jurisdictional coordination shows results. "Key individuals or champions have played critical roles in the development of all new regional [traffic management] organizations." (Briggs 1999)

3. Role of planning processes.

Comprehensive planning is sometimes advocated to ensure coordination of individual projects, build a shared vision of goals and project architecture, and ensure compatibility of technology. The Institute of Transportation Engineers (ITE) recommends development of an ITS regional strategic plan to "identify the 'big picture' vision for the future development of ITS in a region and state." Plan development "is intended to broaden the thinking beyond individual agencies and serve as a catalyst for promoting greater consideration of region-wise M&O issues …" (ITE 1999, p. 12)

ITE notes that the level of detail in regional strategic plans will vary, and that small metropolitan areas or communities may not need a complex, multiyear ITS strategic system plan. (ITE 1999, p. 12)

Planning is also useful to identify funding sources and ensure that appropriate resources will be brought to bear. "The funding, phasing, training, personnel and other resources required to support the potential operations and future support needs identified for systems in a region should be identified." (ITE 1999, p. 12)

A more modest view of the planning process emphasizes building a shared vision and mutual understanding of each agency's needs but without the level of detail implied by comprehensive planning. Review of four federally-funded ITS model deployment sites emphasized the need for each agency to develop a regional perspective. "A regional perspective means that project participants view projects from the standpoint of the other project participants as well as their own." (Volpe 1999, p. xii)

Other studies emphasize incremental approaches. It is easier for agencies to agree to a first step than an overall plan, and it is quicker to show results which can then be built upon. "While there is an appropriate role for comprehensive, all-inclusive, top-down plans, real-world successes were often best achieved using an interative approach. First, a tangible product is developed. … This can result in buy-in by various stakeholders more readily than trying to have them reach an up-front agreement on a thick paper plan." (Mitritek Systems 1996, p. 29)

Many accounts of ITS deployment and inter-jurisdictional cooperation note the building-block nature of project development. In Phoenix, state, county and city staff all cited earlier coordination of traffic signal control systems "as instrumental in teaching transportation agencies how to build up interagency and cross-border cooperation." (Volpe 1999, p. 5) The same was noted in San Antonio (Volpe 1999, p. 6), Houston (Wiersig 1997) and Seattle (SAIC 200b, p. 17).

4. Technology compatibility.

It only seems to make sense for neighboring or overlapping jurisdictions to adopt compatible equipment and software to make interconnections simpler, faster and less costly. This is easier said than done, however. Each city, county, state or other agency must follow its own procurement procedures which are typically designed to select the lowest qualified bidder for equipment purchases. The low bidder for one project may not be low bidder for another project. Agencies may attempt to specify compatible technology. Procurement officials may not permit narrowly written specifications, however. If allowed, they may drive up prices. Another problem is the rapidly changing nature of the technology. Equipment and software is constantly improving while costs are often reduced. A prohibitively costly technology may become quite affordable, as has occurred with fiber optic networks in many instances. Thus, agencies often end up with different generations of technology intra-agency as well as across agencies.

The issue then is, how can agencies cope with compatibility issues? Are there ways to ensure compatibility? Are there ways to make incompatibility less important?

U.S. DOT established a National Architecture to lay out a common approach for design and implementation of integrated ITS systems. While providing a framework for system elements, the National Architecture "does not prescribe any technologies, designs, or policies." (JPO 1996) Thus, it remains with local and state agencies to coordinate their uses of technology. Inter-jurisdictional committees or teams can "continuously work to standardize and implement compatible systems." (ITE 1999, p. 8)

5. Public-private partnerships.

Public-private partnerships have long been touted as a way for government to involve the private sector in sharing risks and costs of program development. Attempts at public-private partnerships have met with less success than was hoped for, however. (Mitritek Systems 1996) A variety of explanations are offered. These include diverging missions, resistance to change, different languages spoken by public and private entities, lack of communication and difficulty fixing accountability. (Hauser 1999) A federal assessment of ITS deployment in seven metropolitan areas found that, "The role of traffic management has been traditionally the role of the public sector and this perception has not changed. Also, public transportation officials have not been able to define a specific role for the private sector, other than as vendor or contractor." (Volpe 1996, p. 14)

An analysis of a public-private partnership to broadly disseminate traveler information in the San Francisco bay area concluded that:

> … it was necessary to adjust the public and private partners' differing expectations of TravInfo in order to work toward the common goal of disseminating accurate, reliable, timely and multi-modal information to Bay Area travelers. The public partners expected to make TravInfo available for better congestion management, while the private partners expected to test and market products that would make a profit. It took a long time to reconcile their differing objectives. (Yim & Deakin 1999)

In the face of this experience, how should large cities approach the possibility of seeking such public-private partnerships?

COMPARISON WITH LARGE CITY CASE STUDY FINDINGS

In some respects, the study team's findings for the three large cities visited mirror results from the literature review. In other respects, previous literature only partly captures this study's findings. Below is a summary of how the literature compares with the experience of the three cities visited.

Note that while naturally the literature showed a considerable diversity of experience, the three cities visited evidenced remarkable consistency. This presumably owes at least in part to the effects of city and metro area size and complexity.

Type of relationships: Inter-jurisdictional relationships in the three large cities visited exhibit an interesting combination of characteristics. Formally, the relationships tend to be decentralized rather than centralized, characterized by coordination directly between agencies in a web-like fashion rather than a hub-and-spoke system. Despite relatively high organizational autonomy, the most productive inter-jurisdictional relationships usually involve close personal relationships among agency staff. Because it enhances close staff relationships, TMC personnel prize face-to-face interaction even though they have the technical ability to communicate across large distances.

Need, funding, benefits and catalysts: Site visits firmly echoed the literature's emphasis on focusing of visible public needs, identifying common interests and finding new money for new tasks. The leadership of high-level champions was also critical to early program development in all three cities.

Role of planning processes: Experience in the three large cities comes down firmly on the side of incremental, bottom-up, building block approaches to developing and coordinating traffic management. This is particularly the case for early project development.

Technology: Just as the federal ITS program has moved from a focus on implementing technology to a focus on addressing operational, management and institutional issues, the three cities saw a focus on these issues rather than on solving technology constraints.

Public-private partnerships: The difficulties of pioneering in this area were evident in some of the site visits. Traffic management remains a public function in these cities, carried out for broad public benefit with a chary eye aimed at efforts to limit dissemination of information for private sector profits.

4. FINDINGS

To evaluate how large cities have successfully dealt with the institutional issues described above, the project team visited three cities—Los Angeles, Houston and New York. These cities were selected based on their successful experience with implementing traffic management coordination and ongoing programs to enhance inter-jurisdictional coordination. The study team was thus able to see both the fruits of completed projects and discuss current efforts and issues.

Houston

The City of Houston is part of the TranStar TMC where all participating agencies are housed in a central facility. Each agency maintains operational control over their jurisdictional system, but the agencies readily share information, technical expertise, jointly fund projects, barter activities based on the individual capabilities of each agency and cooperate in a wide ranging program of regional activities including incident management and emergency management. Participation in TranStar has strong support from the current Mayor. A previous Mayor was instrumental in the establishment of TranStar and is viewed as "the champion" of this effort as well as the architect of the common vision for Houston which is shared by all agencies.

The City of Houston is currently developing a traffic signal control system in conjunction with the county.

Los Angeles

The City of Los Angeles has been a leader in the development and implementation of an Automated Traffic Surveillance Center (ATSAC). ATSAC staff monitor conditions on city highways, monitor the control strategies programmed into the central computer and intervene in unusual conditions and special events. This system is in place for many of the signals in the city and is in its second generation of control strategies. The TMC is tied to many high visibility city activities including special event planning, emergency management, data archiving, goods movement from the Port, economic development, neighborhood protection, and fire and police protection. The TMC and ATSAC have strong political support at all levels of government. The champion for this effort was a former director of the L.A. DOT and the current director is viewed as the current champion.

One unique feature of L.A.'s system is that it was developed with in-house staff and is being maintained and upgraded again by in-house staff. The City shares information with the State TMC and several other TMCs in the area. The City has cooperative agreements with several other jurisdictions in the area.

L.A. took a leadership role in working with the State DOT (Caltrans) and other agencies in the Santa Monica Smart Corridor Program in the mid-1990s. Two other projects were included as part of the case study: (a) a bus priority program with the Los Angeles County Metropolitan Transportation Authority and (b) a county-wide signal

synchronization program, involving the MTA, L.A. County and municipalities throughout the county.

New York City

The City of New York has had a long-standing program of upgrading and interconnecting traffic signals in the city and establishing a central TMC including video surveillance. The TMC has recently been upgraded and has been operational for several years. The responsibility for traffic management has been modified in recent years where the Police Department now has a major responsibility for day-to-day traffic management and incident management. The Police traffic functions are co-located in the same building with the City TMC. Co-location has resulted is numerous cooperative activities which were not possible in the past.

N.Y.C. DOT is also part of the three state regional TMC (TRANSCOM) through which DOT shares information with the other members of TRANSCOM. In addition, N.Y.C. DOT recently obtained federal financing for a fiber optic network that will enable coordination with New York City Transit and MTA Bridges and Tunnels.

The State and City TMCs are co-located in the same building. The plan is to have N.Y.C. DOT eventually take over the state TMC and traffic management of the state highways in the city (consistent with state law). Currently the State DOT is installing the ITS infrastructure as part of highway reconstruction projects and is operating the systems during construction as part of the construction traffic mitigation program. After construction is completed the ITS systems will be turned over to the city as well as operational control.

The degree of political support for the TMC in New York is not as pronounced as in the other cities and the TMC activity is basically below the political radar screen.

Table 1 summarizes agency involvement, functions and initial focus of TMC coordination in each of the three cities.

Results from the case study visits are synthesized in the next three sections. The first section highlights a dozen lessons learned from the case studies, organized in three groups. Further detail for each of the case studies is provided in the discussion of each city later in this report. The second section discusses what the study team did *not* find. These are areas that the study team expected might be important but were not. The third section itemizes technological and institutional innovations found to be successful in the three cities. Other large cities may wish to borrow some of these “neat ideas.”

Table 1. Summary of Features of TMC coordination.

	Los Angeles			Hous-ton	New York City		
	Smart Corridor	County-Wide Signal Synchronization	Bus priority	TranStar	TRANSCOM	Coord. Between NYC agencies	NYCDOT, MTAB&T, NYCT sharing
Agencies involved							
City transportation dept.	✓	✓	✓	✓	✓	✓	✓
County transportation dept.		✓		✓	✓[2]		
State transportation dept.	✓	✓		✓	✓		
Police, Fire, emergency services (some or all)	✓			✓	✓	✓	
Transit agency	✓	✓	✓	✓	✓		✓
Functions							
Incident management	✓	✓	✓	✓	✓	✓	✓
Traffic management	✓	✓	✓				
Emergency response	✓			✓	✓	✓	
Special events	✓	✓		✓	✓	✓	✓
Construction coordination					✓		
Transit service		✓	✓	✓			✓
Form							
Central organization acting as clearinghouse or facilitating coordination					✓		
Sharing information between separate locations	✓	✓	✓	✓			✓
Sharing information at central location				✓		✓[3]	
Primary needs driving program at outset							
Special events	✓						
Traffic incident management	✓	✓		✓	✓	✓	✓
Traffic management/congestion reduction		✓		✓			✓
Construction conflicts					✓		
Transit service improvement			✓	✓			✓

[2] Counties outside New York City were involved. There is no separate County government overlapping with New York City.

[3] Currently separate city and state traffic centers and city police center in adjacent rooms at one location.

LESSONS LEARNED

People-Related Lessons Learned

Inter-jurisdictional coordination is ultimately not between agencies but between individuals. The first three lessons learned address ways to build trusting, effective relationships between staff at different agencies.

Develop in-house technical expertise

In all three cities, technical expertise was critical to establishing, maintaining and developing inter-jurisdictional relationships. In the cities visited, in-house staffing proved vital to TMC coordination.

There are several reasons for the importance of technical expertise. Perhaps most important is that expertise is essential to building trust. Staff in one agency will not trust the information coming from another agency, or trust the other agency to use its information responsibly, unless the staff in that other agency demonstrate knowledge and competence. Expertise thus builds trust, and trust builds relationships.

A closely related point is the importance of similar levels of expertise for healthy peer relationships. In L.A., for example, officials wanted to be sure that neither agency is too far "ahead" or "behind" the level of staff capability or expertise of the other. Comparable levels of expertise build a more equal, mutually beneficial relationship.

Second, staff expertise is vital to integrating new technology into existing systems. It takes a considerable level of expertise to understand how the existing system works and how new systems and equipment can improve the operation, and then to successfully implement those improvements. Since inter-jurisdictional coordination develops with implementation of new technology, staff expertise is critical to the coordination efforts.

Often, in-house staff's ability to be expert in multiple areas is critically important. An excellent example is seen in Los Angeles, where in-house traffic engineers have developed the software for an advanced adaptive traffic control system. Managers in L.A. commented that outside software developers could not have matched these traffic engineers' understanding of traffic dynamics needed for the adaptive traffic control system.

Third, staff provide continuity. Inter-jurisdictional relationships develop over long periods of time and continuity is critical.

Finally, staff capability can play a vital role in obtaining funding. L.A. DOT, for example, has been able to attract and retain staff by continually challenging them with new projects. The department has been successful in obtaining external funding for this in-house staff so they are off-budget.

Critical role of face-to-face interaction

Face-to-face interaction is a key aspect of the TranStar operation in Houston, and in N.Y.C. DOT's coordination with the city Police Department in New York City. Staff in both locations extolled the value of face-to-face interaction. Staff proximity (in the same large room in Houston and in adjacent rooms in New York) enables agencies to become immediately aware of events as they transpire. In Houston, the ability of staff to simply call across the room is cited as a major benefit of TranStar. Proximity also exposes staff from each agency to the functions of other agencies. Staff see the issues, problems and complexity that their colleagues must deal with. This appreciation promotes understanding and greases the way to better cooperation.

Face-to-face interaction is particularly important to emergency situations and complex problem-solving. Relatively routine traffic management is more readily conducted using electronic communications. Looser forms of coordination, in which agencies share information but each agency independently decides what actions to take, are also readily carried out from remote locations. Staff proximity is most productive where the task is to coordinate traffic and emergency response to a freeway spill of hazardous materials, for example.

Officials in New York and Houston attributed their success in developing new forms of interagency cooperation to their ability to deal with each other in person. Face-to-face interaction was important to a NYPD police sergeant's gaining appreciation for the technical capability of N.Y.C. DOT traffic engineers, and thus critical to expanding coordination from incident management to signal adjustments in complex intersections such as Herald Square.

Value of staff moving among agencies

In a few cases, inter-jurisdictional cooperation was built on collegial relationships built before some agency staff moved to another agency. A good example is L.A. DOT's operation of Culver City's traffic signals. Culver City's traffic engineer formerly worked at L.A. DOT. He understood how LA's system worked and trusted the operating decisions of L.A. DOT staff.

Resources and Technology

The next four lessons learned focus on ways to make the best use of the resources and technology at the disposal of each partner in interagency coordination.

Let each partner focus on its strengths

A major payoff from inter-jurisdictional or interagency cooperation is that each agency can be in charge of the aspects of the overall project that are best-served by its strengths. An example is procurement, where one agency has procurement procedures that are better adapted for moving forward more quickly or easily. Another example is staff expertise. In the design and construction of Houston's TranStar facility, for example, the

State let the construction contracts, Metro was responsible for the communications systems, the City handled the finances and the County maintains the building.

In New York, the Police Department issues stiff fines to construction companies that violate their N.Y.C. DOT permits. This enforcement sharply reduced infractions concerning the number of lanes that can be closed or time of day of the closures, thus improving traffic flow.

Plan for O&M costs up front

This lesson echoes the national literature. While capital funds are often ample, most local and state governments are squeezed for operating funds. A few thousand dollars or even less can make the difference between inter-jurisdictional coordination proceeding or not. For example, several smaller jurisdictions were unable to procure beepers in the early TRANSCOM days, more because of paperwork than cost. TRANSCOM provided the beepers free and these jurisdictions became active members. In the southeast portion of Los Angeles County, fairly small differences in operating costs governed selection of communications technologies for a new signal coordination system to ensure participation of several smaller cities.

Take advantage of opportunities to barter

Formal interagency agreements can be difficult and time-consuming to consummate. Difficulties may be compounded when substantial amounts of money are involved. Various forms of bartering among agencies can help sidestep these challenges. In Houston, for example, agencies have kept a running tab on the contribution of each agency as various projects are developed and procured. Over time, they have worked out what they feel is a fair apportionment of costs. While one agency may invest particularly heavily in one project, therefore, it may invest less in another. Project tasks can thereby be allocated built upon staff expertise, procurement requirements, funding sources, staff time availability and other pertinent factors without worrying about the exact cost apportionment of each particular project.

Don't lock in technology

Much of the technology used in the three cities is compatible across agencies. In some cases, agencies set up procurement mechanisms to ensure that each agency buys the same software. For example different agencies in Houston are purchasing software from the same supplier.

While acquisition of the same software can be desirable, compatibility can be sacrificed when necessary. This sacrifice may be necessary because technology is changing rapidly. Signal controllers that were unaffordable a couple of years earlier may be affordable now. Incompatibility may also arise because of legacy systems, or because of agencies' procurement requirements such as low bid requirements. Technology can be the solution to this technology problem. An example is the countywide signal synchronization program in Los Angeles County, which utilizes a software kernel that translates between each city's software.

Keys in Early Stages

The final lessons learned are particularly applicable in early stages of inter-jurisdictional coordination that face the challenges of overcoming inertia and mistrust and gaining support for something new.

Address high-visibility problems

Agencies in all three cities began their inter-jurisdictional cooperation focused on problems with significant public and political visibility. Los Angeles focused on preparing for the 1984 Summer Olympics, which were widely feared, might produce nightmare gridlock. New York's TRANSCOM began by coordinating different agencies' construction projects after several well-publicized traffic tie-ups from construction-related closures on parallel routes. Houston first focused on building a 103-mile network of high-occupancy vehicle (HOV) lanes.

Beginning with high-visibility problems helped focus each agency on the task at hand, overcome institutional inertia, and rally the necessary funding and staffing. Once initial projects show results agencies are able to tackle less-visible problems. For example, the NYPD and N.Y.C. DOT broadened their coordination efforts from incident management to less-visible day-to-day operational issues such as enforcement of the terms of construction permits.

Identify common interests

One of the greatest barriers to inter-jurisdictional cooperation is that agencies' different missions and constituencies can create diverging program objectives. A state DOT, for example, may focus on moving traffic through an area while city officials may be more concerned with minimizing neighborhood traffic impacts. Diverging interests typically kill attempts at inter-jurisdictional cooperation. Thus, all three cities identified and focused on areas of common interest, particularly at the beginning. The high-visibility problems listed earlier show this commonality of interests.

Officials in the three cities explicitly address possible conflicts to prevent one agency's actions from affecting another agency's facilities. For example, Caltrans does not divert freeway traffic to local streets no matter how congested the freeways become. Variable message signs advise motorists of alternate freeway routes but not arterial routes. In setting up ramp metering, Caltrans prevents cues on the entrance ramps from backing up onto city streets.

Proceed incrementally

Inter-jurisdictional coordination in traffic management in the three sites cities has proceeded incrementally over a considerable period of time. Individual projects are conceptualized, planned, developed and implemented in response to specific needs identified by agencies and elected officials.

There are many benefits from taking a bottom-up, incremental approach. These include ease of planning and implementation, strong focus on needs, showing results relatively

quickly, building support for additional funding based on demonstrated results, and building trust as a basis for further efforts.

Proceeding incrementally is most important in the early stages of inter-jurisdictional coordination. In L.A., for example, the more comprehensive, area-wide efforts have followed demonstration or showcase projects. In Houston, integration of emergency management with traffic management followed well after the original design and implementation of TranStar.

Ultimately, incrementalism expands the scope of possible coordination and its potential benefits. Completion of one project spawns cooperation in other areas. In New York, for example, TRANSCOM's incident detection led to highway advisory services using the same information. Congestion data from EZ-Pass speed probes is used to measure the extent of delays, providing agencies with data to decide whether to take such actions as issuing alerts or reducing construction lane closures.

Don't overpromise

New programs are built on promises but officials interviewed for this project stressed the importance of only making promises that they felt confident of achieving. Their success came from demonstrating incremental improvements rather than trying to hit the home run. This approach built institutional, public and political support.

Be lucky, have a champion

All three cities emphasized the critical role of a high-level champion. Houston's TranStar was championed by a Mayor who had also held top jobs as a member of the Texas Transportation Commission and chairman of the transit agency. L.A.'s traffic management center was the priority project of L.A. DOT's general manager. New York's TRANSCOM was established by a top official at the Port Authority of New York and New Jersey and supported by earmarked funding sponsored by a New Jersey Senator.

These high-level champions brought financial and political support to traffic management inter-jurisdictional coordination. They cut through institutional resistance and kept agencies focused on responding to high-visibility problems. These champions also brought tenacity, sticking with the projects until they produced results. As inter-jurisdictional coordination demonstrated value, the champions became less important. Traffic management became institutionalized and recognized as a good thing. But it is quite notable that in each city, champions played critical roles in initial stages.

WHAT WE DID NOT FIND

Just as there are lessons learned, there are lessons not learned. These include issues that were raised at the outset that did not prove to be major issues in practice; possible constraints that were not in fact significant issues; and approaches recommended by some that did not prove in practice to be workable.

Non-Issues

Giving up operational control

The issue of sharing or transferring operational control was a major concern raised by large-city staff in planning the case studies. It was not an issue in the three sites visited because agencies virtually never gave up operational control and shared control in only modest ways.

In some cases, agencies share pan, zoom and tilt capabilities of CCTV cameras and authority to post messages on variable message signs. While these are significant examples of sharing, they fall far short of transferring control of traffic signals or one agency directing another agency's emergency response, for example.

None of the officials interviewed felt that they should go further in shared control. They cited a number of reasons centered on the importance of each agency meeting its legal, operational and political obligations. Even on a purely technical level, staff felt that shared control was unwise. For example, Caltrans, county and L.A. DOT staff pointed out that if Caltrans took over traffic signals near freeway entrances, Caltrans staff would need to understand the ramifications of changing signal timings on construction projects and special events over a wide area. No one thought that this would work out well. The solution was coordination rather than shared control.

Centralized vs. decentralized

From a distance, TRANSCOM and TranStar appear to be centralized while the Smart Corridor project in L.A. is decentralized. In actuality, the study team found less difference than meets the eye. There is an obvious difference in the centralization of place in Houston (staff under one roof) and in TRANSCOM's serving as a centralized hub for information flow in New York. As discussed earlier, however, basic operational responsibilities were not centralized. Even with respect to TranStar, which appears to be the most centralized of the three cities, officials described the organization as a "loose umbrella" in which staff "work separately together."

It is notable that current developments are marked by greater decentralization *and* closer coordination between agencies. For example, the countywide signal synchronization program in L.A. County will have no hub or center, instead providing direct links between multiple agencies. In New York, TRANSCOM is focusing more on packaging traffic information for public consumption while several member agencies are developing closer direct ties. In both cases technology such as fiber optic networks and software solutions

that link different computer systems make it easier for agencies to deal directly with each other while making less important a central hub or clearinghouse for information gathering and dissemination.

It is also notable that the decentralized, "no one in charge" model applies to inter-jurisdictional coordination but not necessarily to intra-jurisdictional, interagency coordination. Coordination between N.Y.C. DOT and NYCPD was greatly aided when City Hall anointed the Police as in charge of incident response. With the PD clearly in charge, each agency could focus on carrying out its functions without worrying about being held accountable for problems outside their domain.

Non-Constraints

Technology

All officials interviewed agreed that the needed technology exists, both hardware and software. Technology was not a constraint to development of traffic management or to inter-jurisdictional coordination. In fact, new and rapidly advancing technology helped advance the cause of inter-jurisdictional coordination, as discussed earlier.

Federal regulations

Federal regulations did not arise in discussions concerning planning or implementation issues with traffic management or inter-jurisdictional coordination.

Capital funding

Officials interviewed in the three cities felt that sufficient capital funding was and is available to move their projects forward.

Nonsense

Comprehensive plans

As discussed earlier, inter-jurisdictional coordination in traffic management in the three sites has proceeded in an incremental, building-block fashion.

While some literature suggests that a planning process can help form a shared vision among agencies, the experience of the three cities is the reverse. During the process there develops a common shared vision of capabilities and objectives for the systems being developed. This shared vision is very important and leads to further system development. In L.A., for example, the more comprehensive efforts followed the initial demonstration programs that built a common vision and demonstrated that different systems can work together. But none of the cities visited had first developed a comprehensive plan for inter-jurisdictional coordination or for traffic management itself. Nor did any think that a comprehensive plan would have been useful.

Formal agreements

There are different types of formal agreements. L.A. and Houston developed formal contingency plans for various incidents that could arise. N.Y.C. DOT and N.Y.S. DOT are developing a formal interagency agreement. Officials interviewed tended to cite formal agreements as a necessary (and often challenging) step in coordinating their activities. While important in taking the necessary steps of formalizing inter-jurisdictional relationships, these formal agreements were not felt to have helped the process move forward. Much more important were the staff relationships and need to respond to visible problems.

NEAT IDEAS FOR LARGE CITIES

The detailed case study descriptions will present a number of technological and institutional innovations that have proven to be successful in the areas visited. In this section we set forward innovations or approaches (not in priority order) that we feel have particular relevance to large central cities.

1. Transit priority system (TPS) - Los Angeles. The Los Angeles Department of Transportation is designing and implementing a transit priority system in conjunction with the Los Angeles County Metropolitan Transportation Authority (MTA). Using the existing coordinated signal system (ATSAC) and the in-house expertise, L.A. DOT is able to support and contribute to a regional objective to create a traffic signal priority system for busses to improve bus speeds and attract more riders to the transit system.

2. Co-location of traffic and police personnel in an ITS facility - New York City. Following the transfer of some traffic enforcement functions from the N.Y.C. DOT to the N.Y.C. Police Department, the personnel of the two agencies which did not have a history of cooperative activities were co-located in the city DOT TMC. The agencies have now found many ways to work together to enhance each agencies' programs that go well beyond the previous responsibilities which were transferred.

3. Emergency management and incident management co-location with ITS in a TMC - Houston. Co-locating two functions with high political visibility and support (emergency management and incident management) with a less politically visible function (ITS) has produced many new cooperative programmatic approaches to solving problems as well as raising the visibility and support for traffic management.

4. Constructing the ITS infrastructure as part of a highway reconstruction or rehabilitation project and using the ITS capability as part of the maintenance and protection of the traffic component of the construction project - New York City. New York DOT instituted a program to construct the ITS infrastructure as part of each contract to reconstruct and/or rehabilitate the major highway facilities in New York City. Since the maintenance and protection of traffic is a critical (and expensive) component of any construction project in the city, the use of the ITS capability is very helpful during construction and establishes a working model for operation after construction.

5. Developing, funding and maintaining in-house expertise for traffic management and communications technology - Los Angeles. L.A. DOT has successfully developed their traffic signal coordination and control system (ATSAC) using in-house staff supplemented by consultants. Having in-house capability has proven to be very cost-effective and has been instrumental to the success of ATSAC. The in-house staff is also available to tackle additional ITS applications with other agencies in the area where L.A. DOT can contribute expertise to a cooperative venture. Training and funding for the staff has also been successfully provided.

6. Portable video units at incidents linked to the TMC - New York City. One of the major desires of the managers at TMC's in New York City is to have a picture of what is happening on and near the facility, especially during an incident. New York City is developing a number of approaches to dispatching portable video units to the scene of incidents which will allow the managers at the TMC to see what is happening and make the necessary adjustments.

7. Toll tags as traffic probes- Houston, New York City. One of the challenges for a TMC is to determine changes in traffic flow due to incidents or unusual conditions where video surveillance is not present, as a basis for intervention with traffic management strategies. The use of toll tags as traffic probes is being used successfully in Houston in conjunction with the Texas Transportation Institute (TTI) and in New York through a TRANSCOM demonstration project.

8. Developer mitigation/franchising to accomplish programmatic objectives- Los Angeles, Houston, Portland. In many instances, developers or other organizations requesting permission to operate and/or build in a large city must obtain approvals from non-transportation agencies. By actively participating in the approval processes, transportation agencies can obtain funding and facilities to enhance transportation objectives. Examples in Los Angeles and Houston show where developers have contributed to the installation of an overall coordinated signal system upgrade as part of a developer traffic mitigation plan. In Portland, the agencies promoting a coordinated fiber optics system used the franchising process to have a developer install a missing link in the fiber optics system.

9. Public-private motor assistance program (MAP)- Houston. Houston was able to develop a motorist assistance program through a unique public-private partnership. The MAP vehicle drivers and motorist assistants are county sheriff deputies and their salaries are paid for by METRO, the regional transit agency. Texas DOT provides the dispatcher. Houston Cellular donates a cell number and the Houston Area Auto Association donates the vans on a four-year replacement cycle.

5. LOS ANGELES CASE STUDY

PROJECT OVERVIEW

Traffic management in Los Angeles has grown and developed with a series of projects. The study team looked in detail at inter-jurisdictional coordination of three projects: Smart Corridor, bus priority, and county-wide signal synchronization.

Smart Corridor

The Santa Monica Freeway Smart Corridor Demonstration project is an operational test of various Intelligent Transportation Systems (ITS) technologies and traffic management strategies. The Smart Corridor project boundaries consist of a 14 mile segment of the Santa Monica Freeway (Interstate 10) from the Santa Ana Freeway (Interstate 5) to the San Diego Freeway (Interstate 405) and five parallel major arterial streets; Adams, Washington, Venice, Pico, and Olympic Boulevard.

The agencies involved in this joint regional corridor project include: Caltrans District 7, Los Angeles County Metropolitan Transportation Authority (MTA), City of Los Angeles Department of Transportation (L.A. DOT), California Highway Patrol (CHP), and the cities of Santa Monica, Beverly Hills, and Culver City. The operational test began in 1996 and was considered a national example of successful implementation of inter-jurisdictional traffic management. The expert system, however, was deactivated in the late 1990s as Caltrans felt that a different organizational model would be scalable to cities in the entire county.

Bus Priority

L.A. DOT collaborated with the MTA to implement an advanced Transit Priority System project for buses along two major transit corridors. Under the project, signal timings can be adjusted as buses approach an intersection in order to help buses catch up to schedule when needed. Four types of signal priority action can be taken, including providing an early green signal and extending the green when a bus is approaching. The system also provides information on bus locations and travel times for MTA managers.

This demonstration project has been implemented on Ventura Boulevard and Wilshire/Whittier Boulevards. The Ventura Corridor connects the Metro Red Line subway station at Universal City with Warner Center, a major commercial and business center in the West San Fernando Valley. The Wilshire/Whitter Corridor connects East L.A. with the central business district. Together, the two corridors include 200 signalized intersections on over 38 miles of arterial road.

County-wide Signal Synchronization Program

This project, led by MTA with the active support of the county, involves synchronizing traffic signals across jurisdictional boundaries. The MTA divided Los Angeles County into eight areas and formed a “forum” or working group for each area. The working group in

the southeast part of the county is planning major traffic signal improvements in five corridors in the area. The synchronization program will involve direct information sharing on a distributed network among the County, MTA, Caltrans and nine municipalities in the southern part of LA County.

Although the City of Los Angeles is not currently directly involved in this program, MTA and County staff were interviewed because it was felt that the program provides a demonstration of future coordination that will involve the city.

MAIN LESSONS LEARNED/USEFUL IDEAS FOR LARGE CITY TRANSPORTATION OFFICIALS

1. There are many benefits from taking a bottom-up, incremental approach. These include ease of planning and implementation, strong focus on needs, showing results relatively quickly and building support for additional funding based on demonstrated results, building trust as a basis for further efforts. The more comprehensive, area-wide efforts have followed these initial demonstration or showcase projects and are necessary to develop a common vision of the future and to ensure that different systems can share information and communicate. It is also important to implement projects in manageable (geographically and technically) pieces. For example L.A. DOT has developed ATSAC in geographic increments where the area boundaries make sense from a traffic control perspective. In each area, they upgrade the signals (130-150 signals/area) with new controllers, interconnect the system and connect to the hub, install loop detectors and add about 5 cameras/120 signals connected by fiber optics to the TMC. Each incremental area represents a fundable project.

   It is also possible to adapt new technologies or improvements in technology on an incremental basis. L.A. DOT is adopting and implementing a program to change ATSAC from UTCS to an Adaptive Traffic Control System (ATCS) while continuing to maintain both platforms. Other incremental changes are the transition from a mainframe system to a P.C.-based system and changing signal controllers from 170's to 2070's.

2. Each governmental unit maintains management control of its own facilities. Information is shared, traffic management functions are closely coordinated and control of non-threatening resources such as traffic cameras may be shared. But fundamentally, each agency maintains and remains focused on its own local responsibilities for traffic management. All involved parties agree that there are valid substantive and management as well as political reasons for taking this approach. The inter-jurisdictional arrangements and technologies are built around maintaining local control.

3. Successful implementation requires dealing with operations and maintenance funding issues up front in the planning process. In some cases, technology choices are made to minimize operating costs—in the case of smaller municipal governments this means choosing communications technology that costs a few thousand dollars less on an annual basis.

4. Critical role of funding agencies to use federal, state and locally generated funding to support municipal capital costs and mandate inter-jurisdictional coordination as a condition for receiving funding. In this case MTA is not the MPO but has local statutory authority for planning and programming for a significant portion of funding.

5. Importance of in-house technical expertise in building a successful traffic management program. In Los Angeles, the L.A. DOT has been able to attract and retain internal staff by continually creating new and interesting projects and has been successful in attracting external funding for this in-house staff so that they are off-budget. L.A. DOT has one person dedicated to these administrative and grants writing activities for the ATSAC program.

6. Initial face-to-face discussions on roles, responsibilities and project objectives are critical to find out what can be done and what can't be done. However the resulting coordination is best done at the technical level. While much up front time was spent in developing Memorandums of Understanding between agencies and emergency management plans, such as at the start of the SMART Corridor, the experience has been that once the technical operators begin dealing with real time concerns, the coordination and cooperative approach to problem solving is built up with experience and the MOU and emergency contingency plans are rarely used.

7. There is an opportunity to use developer mitigation funding to advance the TMC program. In Los Angeles, the L.A. DOT is responsible for reviewing developments greater than 50,000 sq. ft. and approving developer mitigation plans. They have required the developers to convert signals to the ATSAC format as part of the mitigation plan. They estimate that 10% of the $150 m program has been funded with mitigation funding.

8. One success factor has been to link up the ATSAC/TMC to as many other governmental programs as possible, including emergency management, data archiving for planning agencies and research organizations, movement of goods from the major ports, economic development, neighborhood protection, fire department, police, etc. L.A. DOT developed ATSAC to be fully justified on the benefits within the city including coordination with other city agencies. Any benefits from sharing information and coordination with other levels of government were viewed as additional benefits.

9. Use peer reviews and professional evaluations extensively before launching into a major effort.

10. Have a vision on where you want your system to be in the next 10 years

DISCUSSION OF KEY ISSUES

(1) What agencies were involved at the start of the TMC inter-jurisdictional process? Why were they selected? What was the role of direct inter-agency relationships vs. multi-agency coordinating committees and the like? How were these relationships structured? Was there a lead agency, and if so, who was it? What were the functions and responsibilities of each agency?

The origins of inter-jurisdictional traffic management coordination trace to efforts in the late 1970s and early 1980s that culminated in coordination for the 1984 Olympics and the Smart Corridor project that officially opened in 1996.

The relationships in Smart Corridor and subsequent efforts are structured primarily as direct inter-agency relationships; there is no central clearinghouse or control center. Bus priority involves coordination between L.A. DOT and MTA. The Countywide Signal Synchronization program will involve direct information sharing on a distributed network among the County, MTA, Caltrans and nine municipalities in the southern part of LA County.

(2) Why did the agencies participate in this effort? What was the role of need to improve traffic flows? Of a regional vision? Of political forces?

Traffic congestion is legendary in Los Angeles and affects nearly every resident of the metropolitan area. As the era of freeway building neared its close, there seemed to be a clear consensus among not only traffic engineers but also elected officials and the public that traffic management could help to alleviate traffic congestion. Early on, the focus was on special events and incident management. The perceived success of traffic management efforts during the 1984 Olympics helped build public support for further efforts and expenditures. The opportunity for further successes created a positive environment for cooperation between Caltrans, L.A. DOT and MTA financial and planning support. Within the City of Los Angeles, upgrades to traffic signal equipment and use of centralized control proceeded with City Council support; Council members felt that they wanted upgrades when they saw results in other areas of the city.

Traffic management coordination thus began from within the transportation agencies, showed results, gained political support and continued to expand. As the system gained a foothold, its expansion was added as an element of regional transportation plans.

(3) What was shared—information, facilities, equipment, communications networks? What was coordinated—incident response, traffic signal control, variable message signs, emergency response? Why did coordination take the form that it did? What tradeoffs were involved? Would additional benefits be achieved with additional sharing or coordination arrangements?

Los Angeles officials defined coordination as having 5 possible levels:

1. Do nothing

2. Share information only
3. Share limited control on special events/incidents
4. Share control on day-to-day operations
5. Complete redundancy.

They feel that ATSAC is at level 3.

With only a few exceptions, transportation agencies in the L.A. area share information and technology in order to coordinate their operations, but do not share control over agency responsibilities such as traffic signals, bus movements, ramp metering, variable message signs, etc. Traffic management staff from the agencies we interviewed felt that this arrangement best meets traffic management, operational, political and legal needs.

Each inter-jurisdictional arrangement is discussed below.

Smart Corridor/TMC coordination

During program planning agencies tended to view coordination as part of a progression of steps. For example, L.A. DOT staff expected that cooperation with Caltrans and other agencies in the Smart Corridor project would start with information sharing and then move toward sharing of control over surveillance cameras, control of traffic signals and variable message signs.

The Smart Corridor project did not move further into sharing operational control for essentially two reasons. First, the agencies felt there were too many risks involved with shared control. These risks are operational, legal and political.

Operationally, staff feel that shared control would require an unattainable level of understanding of other agency's facilities. In order for Caltrans to effectively change arterial signal timings for example, its staff would need to understand not only how altered timings would help relieve traffic from a freeway incident, but also the impacts on other arterials, effects of any ongoing construction on surface roads, special events, etc. Likewise, for L.A. DOT to change ramp-metering settings would require an areawide understanding of freeway conditions. Each agency feels that everyone is best off focusing on its own facilities. There are too many risks of inadvertently choosing a "cure" that is worse than the "disease." Thus, shared control of facilities is avoided for both potential operational problems, and to avoid the legal liabilities that might result.

In addition, and closely related, agency staff feel that they need to be clearly responsible for operation of their own facilities. Shared control would compromise their responsibility.

There are two notable exceptions to the "sharing-only" practice. First, L.A. DOT and Caltrans share control over the operation of surveillance cameras. Each agency can zoom, pan and tilt cameras to obtain the best view of traffic conditions throughout the highway and roadway network. This exception proves the rule, however; shared camera control does not involve signalization, message signs or other traffic-control responsibilities.

Culver City vs Beverly Hills

Coordination and information sharing is illustrated by two separate arrangements between L.A. DOT and adjacent cities: Culver City and Beverly Hills. L.A. DOT reached an agreement with Culver City where Culver City would construct the signal coordination system to L.A. DOT specifications and then turn over the system to L.A. DOT. L.A. DOT operates traffic signals in Culver City and is thus able to coordinate signals timings on major arterials running through both cities. Culver City maintains the signal equipment. There is an agreement on the computerized signal changes in response to changing traffic patterns. L.A. DOT does not intervene in these patterns without contacting Culver City except to respond to a major incident.

The Culver City-L.A. DOT arrangement is aided by financial and staff circumstances. L.A. DOT has pledged 100 hours of free support a year to Culver City, a level that has not been exceeded. The cooperative arrangement is facilitated by the fact that the chief traffic engineer in Culver City is a retired L.A. DOT traffic management center employee.

Beverly Hills' approach contrasts with that of Culver City. Beverly Hills is virtually surrounded by the City of Los Angeles. Several major arteries run east-west from L.A. through Beverly Hills and back into L.A. Beverly Hills operates its own traffic signals while sharing information and coordinating with Los Angeles. About one-half of Beverly Hills' 98 signals are controlled centrally; the status of these signals can be shown on ATSAC terminals. Likewise, Beverly Hills' traffic control center computers show the status of L.A. traffic signals. Staff from the two cities coordinate by phone on signal timings. At one time L.A. DOT had an agreement with Beverly Hills to operate signals on Olympic Boulevard but Beverly Hills took back control.

Beverly Hills retains operational control for several reasons. The city wants to be sensitive to residents' concerns, particularly pertaining to cross-street traffic and pedestrian needs. City staff are also expected to provide same-day response to citizen or City Hall questions, which might be difficult if L.A. controlled the signals. There seems to be an issue of the symbolism if L.A. took over control of a Beverly Hills traffic function.

West Hollywood

L.A. DOT is hoping that a recent agreement with West Hollywood will set a model for future agreements. In response to a proposed major development in West Hollywood and the concerns raised by the city on the impact of the development on traffic, there was an agreement that the developer would upgrade the signals on Sunset Boulevard to ATSAC specifications. It was also agreed that L.A. DOT would take control of traffic signal operation on Sunset Blvd.

Bus priority

In the bus priority project, information on bus locations, bus schedules and signal timings is shared between L.A. DOT and MTA on the Ventura Boulevard and Wilshire/Whittier Boulevard corridors.

As with the Smart Corridor project, the agencies involved share information and coordinate their responses, but each maintains control of their own operations. Occasions for bus priority are carefully defined; the MTA control center requests bus priority when the bus is running late and either holding a green light or giving an early green would be help get the bus back on schedule. L.A. DOT's system evaluates each request in real time, taking into account the need for pedestrian walk time and cross-street traffic volumes.

Countywide Signal Synchronization

This effort is focused on sharing information and coordinating traffic operations, beginning with a showcase program involving nine municipalities in the southeast part of the county, L.A. County, the MTA and Caltrans.

The program does not involve sharing or altering control of traffic signals, ramp meters or other facilities. MTA and County staff note that the various agencies involved do not want to take on the responsibility of understanding other agencies' environments, similar to the point made by L.A. DOT and Caltrans staff.

(4) How were the projects funded? How was public, political and institutional support for traffic management systems built?

Capital funding for these projects has come from federal and state transportation funds, and local funds generated by Prop. A and Prop. C. The Smart Corridor project was built with federal transportation funds.

Capital funding is channeled through SCAG (the MPO) and the MTA, which is responsible for transit and highway planning and funding allocations in L.A. County. The MTA estimates that it has allocated $300 million in funding for traffic management projects. L.A. DOT estimates it has spent $150 million in capital funds on its ATSAC system, broadly defined. This includes $2 million planning grant from the MTA for development of its adaptive traffic control system.

Developers are another source of capital financing. Developers have used ATSAC system expansion and improvements as mitigation measures to offset the increased traffic from office and retail development. Developers are allowed a traffic capacity credit of 7% improvement for funding of hook-ups between ATSAC and traffic signals in a defined geographic area. Funding must be for a defined geographic area, on the basis that the traffic system must be improved in order to realize traffic improvements, not simply for specific intersections or development sites. Developer payments have totaled approximately $10-15 million.

Municipalities fund all operating and maintenance costs. L.A. DOT's ATSAC budget is $1 million annually. Although federal rules allow some federal funds to be allocated to operations, MTA's policy disallows it.

Earmarked federal funding is also important for developing coordination. The SMART Corridor project was initiated with federal funding. Funding for the 9-city showcase

program came from the designation of southern California as a priority corridor in the ISTEA legislation.

(5) What were the main costs and benefits of coordination?

The traffic management system in Los Angeles has documented speed improvements. Agency staff believe that inter-jurisdictional coordination extends these benefits across the city's boundaries and between highway and arterial systems. Benefits were particularly evident during the 1984 Olympics and the aftermath of the 1994 Northridge Earthquake. Calamitous traffic tie-ups that were feared for the Olympics never occurred; the traffic management system was given a share of the credit for this happy outcome. The 1994 earthquake toppled a section of I-10 in the heart of the Smart Corridor. Smart Corridor technology was invaluable in moving re-routed traffic on the adjacent arterials.

Financial costs were noted earlier. Agency staff did not cite any non-financial costs.

(6) What were the catalysts to inter-jurisdictional traffic management? What role did bodies with regional jurisdiction play? Was there a champion who played a critical role? Were funding requirements important? If so, who set the requirements and why? Did the demands of traffic management for special events play a catalytic role?

Champions, funding requirements and special events all played catalytic roles in the development of the traffic management system and inter-jurisdictional cooperation.

In the late 1970s and early 1980s, the L.A. DOT General Manager, Edwin Rowe, championed the ATSAC system. His unremitting efforts over a period of years was critical to bringing ATSAC into existence. Availability of non-city capital funds played a critical role as well; the fact that City General Funds were not used for the initial cost helped ease city approval.

A champion of a very different type was key to development of the Adaptive Traffic Control System (ATCS). ATCS is a PC-based networked system. An ATSAC engineer at home initially developed the software on his own time and initiative. At the outset it was not formally commissioned. The City eventually paid him for the software, copyrighted the code and continued development.

As noted earlier, capital funding from federal, state and regional sources was essential to construction of the traffic management system. MTA funding requirements were critical to coordination between neighboring municipalities. For example, the MTA required that Beverly Hills adopt technology that is compatible with the ATSAC system. The MTA is also funding the Countywide Signal Synchronization program that will enable nine municipalities in southern L.A. County to coordinate their traffic systems.

The important role of special events was discussed earlier.

(7) To what extent was coordination a product of planning processes? What was the nature and extent of the planning processes? Who was involved? To what extent did coordination proceed incrementally? What was the experience with each approach used?

Traffic management programs and the subsequent coordination between jurisdictions came about primarily as a response to a widely perceived need to improve traffic conditions. In the Smart Corridor and bus priority projects, coordination arose because agencies identified particular opportunities to work together. These steps were then incorporated into regional transportation plans, which then made is possible for additional funding to be secured. It seems fair to say that while coordination was not directly a product of planning processes, it has been supported and furthered by regional plans.

Somewhat by contrast, the Countywide Signal Synchronization program originated in the Southern California Priority Corridor project. USDOT designated a 6-county region around Los Angeles as a priority corridor in 1994. Its objective is to bring local agencies up to speed on ITS and integrate the many individual projects into an overall system.

(8) How was trust built between agencies?

The two keys to trust building have been expertise and experience. Effective coordination requires that each agency possess comparable levels of staff expertise in addition to equipment with the necessary capabilities. In contemplating coordination arrangements, staff at each agency wanted to be sure that neither agency was too far "ahead" or "behind" the level of staff expertise and capability at the other agency or agencies. This is important to an effective, satisfactory peer relationship.

As the coordination proceeded, staff at different agencies became more familiar and comfortable with each other and more expert is dealing with traffic events. In Smart Corridor, rather than necessarily wait for the expert system to diagnose a problem and recommend responses, staff often took action first, collaborating between agencies as necessary. In this way, informal coordination often supplanted the formal response plans that had been agreed upon in a painstaking process.

(9) How were control issues addressed?

As discussed earlier for each project, the basic approach to control issues has been to let each agency retain control over its own facilities while sharing information and coordinating incidence response and traffic management. By itself, however, this basic approach is not necessarily sufficient. Two other ingredients seem to be critical to successful coordination. One concerns mutual respect for staff expertise, also discussed earlier. The other is that agencies have been careful to avoid letting their traffic management actions negatively affect other agencies' facilities. For example, Caltrans does not divert traffic from freeways to local streets no matter how bad the freeway congestion may be. Variable message signs are used to advise motorists to avoid a given freeway or take an alternate freeway route but not to get off the freeway onto an arterial.

In operating ramp meters Caltrans ensures that traffic does not spill back into intersections adjacent to the on-ramp. "Q loops" at the start of the on-ramp detects when the ramp is full and ramp meters are adjusted accordingly.

(10)How were issues of compatibility of communications systems, data formats, etc. dealt with? Was this an important issue? At what point was it resolved?

We observed two distinct approaches to this issue—ensuring compatibility in system design, and designing systems using different technologies to work with each other. Compatibility in system design was a MTA requirement for funding of Beverly Hills' traffic signal upgrades and traffic management system equipment. The Countywide Signal Synchronization program takes the opposite tact. Information is to be shared between systems using different technologies by use of a "kernel" that translates between the "language" of each system and the "language" used by the kernel. Participating cities, the county and MTA need not have compatible software but can communicate using this translation software. This approach was felt to be the most practical given the diversity of current technology in use and the reality that procurement procedures prevents jurisdictions from necessarily choosing standardized equipment.

(11)Use of private partners, particularly of interest if traffic information has commercial value.

Los Angeles' approach is to provide traffic information to the media at no charge. Officials view this as the most convenient conduit to the public, and the most effective since the media can be responsible for tailoring the information to the needs of different audiences.

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6. HOUSTON TRANSTAR CASE STUDY

PROJECT OVERVIEW

TranStar is the name given to a consortium founded in 1994. The members of the consortium are the City of Houston, Harris County, the Metropolitan Transit Authority of Harris County (Metro) and the Texas Department of Transportation (TxDOT). TranStar has two main functions—Transportation Management and Emergency Management. The TranStar building, which opened in 1996, houses these two functions and has representatives of the four consortium members as well as other organizations working within the same building.

TranStar has a small staff of 5 people to guide and administer the various programs. Representatives of the various agencies perform the rest of the functions. In the event of a major emergency, TranStar is equipped to be self-sufficient for up to 10 days and has a control room for the major elected officials and their staffs.

TranStar has 3 levels of management. All decisions are made on a consensus basis.

1. Executive Committee that sets policy and decides fiscal matters. The representatives are the District Engineer of TxDOT, General Manager of METRO, Director of Engineering, Harris County and the Director of Public Works, City of Houston.

2. Leadership Team administers agency staff assigned to Houston TranStar. Representatives include traffic managers from the four agencies as well as the Chief of Police, Metro; Emergency Management Coordinator, Harris County; Executive Liaison, Harris County, and Emergency Management Coordinator, City of Houston. Recently the Director of the 8 County MPO (Houston Galveston Council) was added to this group since the 8 county region is developing an ITS architecture for the whole region.

3. Agency Managers Committee, comprised of on-site managers of the transportation and emergency management groups, oversees daily operations.

The history of TranStar can be traced to two factors. The first factor was that starting in 1991, the agencies began to work cooperatively on the establishment of a 103-mile network of high-occupancy lanes (HOV) as one of the primary transportation strategies for the area. This shared common vision and the positive experience of working together led to the TranStar agreement in 1994. The second factor was the presence of a strong champion for both the HOV concept and for TranStar in the person of Mr. Robert Lanier. He had the unique experience of having held leadership positions in three of the member agencies, serving as a member of the Texas State Transportation Commission, Chairman of Metro and Mayor of the City of Houston during the formation of TranStar. Not to be discounted was the role of the head of TranStar, Doug Weirsig, in directing the early development, funding and implementation of TranStar.

Another success factor in the establishment and functioning of TranStar is the structure and responsibilities of Metro. In addition to the normal responsibilities of a transit

authority to run the transit operations, Metro is also responsible for the operation and maintenance of the HOV lanes. Metro builds local roads, provides police for the HOV lanes, administers the Motorist Assistance Program (MAP) and is the recipient of 1 cent of the local sales tax, 75% of which is for transit programs and the remaining 25% is for mobility projects including ITS.

Probably the best way to describe the functioning of TranStar is to use phrases from some of the people interviewed for this case study. TranStar was described as:

> ”a loose umbrella for the coordination of activities”
>
> “ working separately together”
>
> “ like brothers and sisters, we fight a lot but don’t talk bad about any one of us or we will defend each other”
>
> “ creates a level playing field to solve problems”
>
> “ TranStar is no better than any one of its agencies”
>
> “ its not my traffic, it’s everyone’s traffic”

Projects coordinated under the TranStar umbrella can best be described by going around the room in the traffic management center and describing the activity at each agency’s work station.

(1) Metro’s bus transit operations- dispatch, operations and maintenance functions of 1200 buses

(2) Metro’s traffic management police officers- operate the HOV lanes, manage incidents and control the Motorist assistance Program (MAP)

(3) City of Houston Police dispatcher- controls incidents on freeways

(4) Texas DOT freeway management system- variable message signs, ramp metering, highway advisory radio, camera surveillance, dispatch of maintenance equipment during an incident, and dispatch of a heavy vehicle clearing contractor to remove heavy vehicles involved in an incident.

(5) Metro Traffic- a private company that disseminates traffic information to the various media outlets.

(6) City and County Emergency Management Agencies activate an emergency management center in the event of an emergency, monitor current conditions including flood gauges on expressways.

(7) Texas Transportation Institute Automated Vehicle Identification (AVI) system that uses toll tag vehicles as traffic probes to determine levels of congestion.

In the future, TranStar will also be the home for the control center for the new light rail system, which is currently under construction, and the city, and county Regional Traffic Control Signal Systems (RTCSS).

The Harris County Toll Authority that operates two major toll facilities within the county is not part of TranStar. Communication and coordination of incidents are done over the phone.

Projects of particular note for Large Cities Transportation Departments are:

1. The use of toll tags as traffic probes under the AVI program. There are more than 1/2 million tags in circulation in the Houston area. Texas Transportation Institute (TTI) developed the program and administers it under contract to TxDOT. A map of congestion is available in the transportation center for use by all agencies and the public. TRANSCOM has a similar research project underway.

2. The Motorist Assistance Program (MAP) is an interesting partnership. It was originally a state initiative but now the program includes the county sheriff deputies as MAP vehicle drivers and motorist assistants. The motorist assistants' salaries are paid for by Metro, TxDOT provides the dispatcher, Houston Cellular donates a cell number and the Houston Area Auto Association donates the vans on a four year replacement cycle.

3. The agencies are creating a Regional Traffic Control Signal System (RTCSS). RTCSS will provide for surveillance, interconnection, and synchronization of some 3200 signals in the area, 2300 within the City of Houston. It provides a state-of-the art traffic signal/communication system capable of regional transportation management. Signals in the city will be operated and maintained by the City of Houston. The county will own and operate the signals outside of the city and off the state system. In the City on state routes, the state contracts the maintenance and operations with the city. Outside the city, the state owns and operates the signals on the state system. All systems will connect to TranStar eventually. All will use the same software (Gardner systems) and will have compatible hardware. On transit routes, Metro will fund the signal upgrades using federal transit funds and local mobility funds. The agencies are developing a maintenance system (Signal Shop) which will detect signal malfunctions or receive calls on signal failures and transmit the information to the responsible agency. Another software program ICON will automatically report malfunctions and change signal timing for synchronized operation with adjacent controllers.

In addition to these day-to-day functions, TranStar has some $20 million of federal priority corridor projects in various states of implementation (see attached list)

MAIN LESSONS LEARNED/USEFUL IDEAS FOR LARGE CITY TRANSPORTATION OFFICIALS

1. The importance of face-to-face communications. Each person interviewed stressed that having each agency located in the same building and in most cases in the same control room yielded numerous benefits in terms of building trust, joint approaches to solving problems, having exposure to lots of different functions carried out by other agencies, and developing new ways to work together which were not foreseen when TranStar was originally designed. Each agency is immediately made aware of the impact of their actions on other agencies. The ability to "shout over to another agency traffic controller" during an incident was viewed as a major benefit. It seems to be a paradox that in a high-tech atmosphere with the latest communications devices, the benefit most prized by the participants was the ability to interact face-to-face on a day-to-day basis.

2. The importance of technically competent, highly motivated employees. While TranStar is widely viewed as a success, there is a concern on the part of several individuals that the application of new technologies has hit a plateau. One statement was that, "it took ten years of HOV coordination to get TranStar, it will take another 10 years to get to the next level of cooperative operations." Member agencies are struggling with accomplishing the day-to-day primary mission of their agencies and are having difficulty keeping up with the explosion of new ideas and applications coming out of the synergy created by TranStar. This is recognized as a nationwide problem. Nationally, transportation agencies are trying to make the transition from construction-based activities to systems operations-based organizations. There is a shortage of engineers trained in the use of technology for systems operations. And the overall policy of reducing the size of government is impacting traffic management operations. Even with the technological expertise of the member agencies of TranStar, they have still experienced false starts and delays in the development of some programs. All participants stressed the importance of in-house expertise before undertaking large technology-driven projects.

3. A coalition such as TranStar provides the opportunity to use the strengths of each organization in a partnership arrangement. For example, in the design and construction of the TranStar facility, the State let the construction contracts, Metro did the communications systems, the City handled the finances and the County maintains the building. There were many other examples given where the strengths of individual agencies were combined to accomplish a project.

4. The combination of emergency management with traffic management is viewed as bringing benefits to both functions. When TranStar was designed, the emergency management function was not part of the original plan. Now that the functions are combined, the participants have developed many new ways to cooperate not only in times of an emergency but in preparation for an emergency and in dealing with day-to-day incidents.

5. The combination of all agencies involved in incident management into TranStar has proven to be beneficial. The Metro Police have the lead for coordinating incident management. They have created a Freeway Incident Management Plan and Procedures Manual in conjunction with all the other agencies. Combining enforcement personnel with traffic operations staff has provided additional benefits. The combination of emergency management and incident management with traffic operations provides political support for the entire operation since emergency and incident management are highly visible public activities while traffic control tends to be a background operation.

6. When developing inter-agency agreements dealing with technology issues, the agreement should be as general as possible since technology is rapidly changing and future technology cannot be predicted. The tendency in government agreements is to anticipate all possible situations and to incorporate language to handle these contingencies. Experience at TranStar has shown that past agreements could not have anticipated the impact of new technologies and that the time spent in worrying about past contingencies was wasted.

7. The importance of a shared vision (a network of HOV facilities) and a strong champion (Robert Lanier) facilitated the working relationships that led up to TranStar. TranStar has been able to transition from the departure of the Mayor who was the champion of the operation and the hiring of a new Metro General Manager who has a new proposal for transit in the area. Both the new Mayor and new General Manager have become strong supporters of TranStar.

8. The agencies need to have a strategic plan for considering the operations and maintenance costs of not only the individual components of the traffic management systems but also the combinations of new services that are possible when the systems are operational. There are many opportunities for cost savings by joint actions as opposed to each agency doing its own thing. Operations and maintenance considerations may become the limiting factor on how many new areas and programs are incorporated into TranStar.

9. While thinking regionally is important, each agency must also take care of their local constituencies and not ignore the local problems. Cooperation does not discharge local responsibility. Local officials stressed that they must still be aware of and responsive to local constituencies and elected officials regarding day-to-day concerns.

10. The inclusion of a private sector media outlet within TranStar, Metro Traffic, has relieved the agencies of a major responsibility for disseminating traffic information to the public. The information is made available to the private sector without compensation. The feeling is that the dissemination of information to the public has a value that offsets any compensation.

11. Building mutual trust among agencies is a must. This can often be accomplished by starting with small projects with a high likelihood of success and then building off that success with more complex projects. One agency with technical competence in a

particular area can take the lead and set the parameters and specifications for other agencies. In this case, Harris County took the lead in designing the specifications and software requirements for RTCSS. Competition among agencies is not necessarily bad since it increases technical competence and forces other agencies to increase their competence in order to compete.

12. Texas state law gives incident management agencies the ability to quickly clear the traffic lanes on state highways without incurring any liability in subsequent accident proceedings. While this is very useful and used extensively for clearing vehicles, this power is rarely used when there is a fatality or serious injury.

13. The state put out for bid a contract for a heavy vehicle wrecker to quickly clear accidents involving trucks and other heavy equipment. The final bid was $1 since the wrecker figured that they could make their money from insurance companies. This has proven to true and the second time the contract was bid, all the bids were for $1.

14. When writing procedures for handling incidents, knowing who is in charge is important but the plan should also determine "who is in charge of what and at what time" since multiple agencies have responsibilities. The overall goal of TranStar incident management is "to minimize the impact of incidents on traffic congestion and to reduce the probability of secondary incidents."

15. The planning and funding of multi-agency projects takes considerable lead time since the four agencies all have different budget cycles. It normally takes two years to get a project budgeted by all parties.

DISCUSSION OF KEY ISSUES

(1) What agencies were involved at the start of the TMC inter-jurisdictional process? Why were they selected? What was the role of direct inter-agency relationships vs. multi-agency coordinating committees and the like? How were these relationships structured? Was there a lead agency, and if so, who was it? What were the functions and responsibilities of each agency?

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TranStar was discussed in the opening section of this report. Several key points are worth repeating. TranStar owes its initial success to a working relationship that was established before TranStar (the implementation of a network of HOV lanes) and the presence of a champion (Robert Lanier). The success has brought other agencies into the process (incident management, emergency management) and this has strengthened the political and technical base of TranStar. Under the TranStar arrangement and committee structure, different agencies take the lead for different projects based on technical expertise and time availability.

(2) Why did the agencies participate in this effort? What was the role of need to improve traffic flows? Of a regional vision? Of political forces?

Initially the availability of a commonly shared vision of a network of HOV lanes and a bus network was the unifying factor. This vision had strong political support and local and federal funding support as well. The TranStar structure has continued even though elements of the vision have changed over time.

(3) What was shared—information, facilities, equipment, communications networks? What was coordinated—incident response, traffic signal control, variable message signs, emergency response? Why did coordination take the form that it did? What tradeoffs were involved? Would additional benefits be achieved with additional sharing or coordination arrangements?

In its 1998 annual report, TranStar estimated travel time savings of more than 4 million vehicle hours, a reduction in time and operational costs of $69.219 million and a reduction in fuel consumption of 6.501 million gallons and the accompanying exhaust emissions for a benefit/cost ratio of 3.9.

The expertise and the availability of time by the technical experts within a particular agency has been a key toward technology development. Cases in point were the county taking the lead in developing the standards and software requirements for the RTCSS and the role of Metro in the establishment of a shared fiber optics system.

(4) How were the projects funded? How was public, political and institutional support for traffic management systems built?

TranStar is funded from a number of sources. The building that cost $13.6M was a combination of federal and local funding. The small TranStar staff is funded by the four agencies on a 30%/30%/30%/10% share basis with the county being the 10%. Interestingly a large share of the RTCSS is funded with “New Starts” - federal transit funds matched with local sales tax funds through Metro. The rationale is that the bus network is their “new start” and that transit routes need signal coordination and priority. Many projects are funded from the 25% mobility funding program from the local sales tax administered by Metro. CMAQ funds are being used by the county for the county portion of RTCSS. Some signals are funded from developer mitigation procedures but in Houston the developers want to put in and fund more signals than the city feels is warranted. TranStar was also selected as one of the Federal Priority Corridor projects and has received about $20 million under that program. The consensus of those interviewed is that capital money is not a constraint at this time. In fact not all appropriated funds are obligated. The constraint is operations and maintenance funding and the availability of trained technical personnel. Operations and maintenance costs are paid by the member agencies directly. Federal funds are not used for O&M.

(5) What were the main costs and benefits of coordination?

See question 3 for the quantified benefits and costs. However, the participants stress that the primary benefits are the ability to work and resolve problems face-to-face.

(6) What were the catalysts to inter-jurisdictional traffic management? What role did bodies with regional jurisdiction play? Was there a champion who played a critical role? Were funding requirements important? If so, who set the requirements and why? Did the demands of traffic management for special events play a catalytic role?

Special events did not play a significant role in the establishment of TranStar but the TranStar structure is used extensively for special events. One Priority Corridor funded project was the installation of a TV surveillance system for transportation management of Astrodome sporting, rodeo and special events.

(7) To what extent was coordination a product of planning processes? What was the nature and extent of the planning processes? Who was involved? To what extent did coordination proceed incrementally? What was the experience with each approach used?

The evidence of the planning process is only in the shared vision of a system of HOV lanes and a strong bus network. The planning process (MPO) is currently working to create an 8 county ITS architecture. The role of TranStar as a regional center or the development of a series of interconnected centers will be discussed during this development process.

(8) How was trust built between agencies?

Trust was built in two ways. The first is through day-to-day, face-to-face working arrangements and developing the ability to solve problems. Secondly trust was developed by successfully accomplishing joint projects through a partnership arrangement where each agency participates within the level and area of their expertise. All of this operates under the umbrella of the policy committee where top level managers set the tone for trust and cooperation.

(9) How were control issues addressed?

At the current time, each agency retains the control of the facilities under their jurisdiction.

(10)How were issues of compatibility of communications systems, data formats, etc. dealt with? Was this an important issue? At what point was it resolved?

Compatibility problems are worked out through the committee structure in place at TranStar and through coordination and partnerships in advancing the various projects

(11)Use of private partners, particularly of interest if traffic information has commercial value.

The TranStar Motorist Assistance Program has several private partners who have donated equipment to the program. TranStar allows a private media firm to operate out of the facility to disseminate traffic information to the public. The arrangement is a "no revenue-no cost" type of arrangement. TranStar does not get any revenue from the private operator but feels that the private operator is providing a service, which otherwise would need to be provided by TranStar, at no cost to TranStar.

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7. NEW YORK CITY AREA CASE STUDY

PROJECT OVERVIEW

Inter-jurisdictional coordination in the New York-northern New Jersey-Connecticut region began with the establishment of TRANSCOM in 1986 under the aegis of the Port Authority of New York and New Jersey. TRANSCOM is a coalition of 16 highway, transit and public safety agencies that are responsible for the safe and efficient movement of people and goods in the tri-state region. TRANSCOM acts as a multi-agency coordinating committee with respect to construction coordination, incident management and testing ITS technology.

The 16 member agencies of TRANSCOM are the Connecticut DOT, Metropolitan Transportation Authority, MTA Bridges and Tunnels, MTA New York City Transit, New Jersey DOT, New Jersey Highway Authority, New Jersey Transit, New Jersey Turnpike Authority, New York City DOT, New York State DOT, New York State Police, New York State Thruway Authority, Palisades Interstate Park Commission, Port Authority of New York and New Jersey, Port Authority Trans-Hudson (PATH) and the NYS Bridge Authority.

In addition to the central-coordinating model provided by TRANSCOM, major transportation, police and emergency response agencies have developed close agency-to-agency relationships. Most notable are intracity coordination among New York City's transportation, police and emergency services agencies and inter-jurisdictional coordination between the City and State DOTs. Other direct interagency relationships are developing. For example, N.Y.C. DOT, New York City Transit (operator of the city bus and subway system) and MTA Bridges and Tunnels (operator of water crossings between boroughs within the city) recently obtained federal funding for cooperative fiber network with video and other information sharing.

TRANSCOM projects

Construction coordination

TRANSCOM assembles construction plans from its member agencies, identifies conflicts (e.g., closures on parallel routes), analyzes potential impacts and provides a forum for mediating the conflicts.

Incident management

TRANSCOM gathers incident information from member agencies in the tri-state region and transmits it back to these agencies. TRANSCOM also obtains information from the I-95 Corridor Coalition and makes it available to member agencies. Agencies can then take a variety of helpful steps. For example, highway traffic can be redirected around trouble spots, often from one or two states away. Agencies may also pull construction work to free up more capacity on a route parallel to the incident.

Implemented in the mid-80s, TRANSCOM currently uses a combination of alphanumeric pagers, fax and phone. TRANSCOM is setting up a system called the TRANSCOM Regional Architecture in which incident information will be shown in map form on computer screens. Users will be able to zoom in on a particular area and click on icons representing particular incidents to see additional detail.

Technology testing

TRANSCOM acts as the lead agency to test new technologies that can then be adopted by other regional agencies. A current example is use of EZ-Pass tags as speed probes on major highways, currently scheduled for completion on 220 miles of highways by the end of 2000.

Model Deployment Initiative

TRANSCOM is the lead agency in this federally-funded project to provide traveler information and personalized trip services.

Direct inter-agency coordination

Direct coordination and sharing among operating agencies takes a number of forms. The two most relevant programs are:

Emergency response within New York City

Several New York City agencies including the City DOT, Police Department, Fire Department, Sanitation Department and Office of Emergency Management are involved in responding to a variety of incidents ranging from traffic accidents to fires, building collapses and chemical spills. At least as far as DOT is concerned, the Police Department is the lead agency for emergency response.

Video sharing.

New York City DOT has obtained a federal grant to construct a fiber optic network connecting City DOT, New York City Transit and MTA Bridges and Tunnels. The fiber network will carry video feeds and data generated by the three agencies.

MAIN LESSONS LEARNED/USEFUL IDEAS FOR LARGE CITY TRANSPORTATION OFFICIALS

1. Begin with projects that are win-win for all agencies involved and produce clear and highly visible benefits. As an early example, TRANSCOM's construction coordination got off the ground after several well-publicized traffic tie-ups. These experiences showed the price of not cooperating and built support among agencies, the public and elected officials for TRANSCOM coordination. Coordination between N.Y.C. DOT and the NYPD has produced clear benefits for both agencies ranging from better traffic management to enforcement of the terms of construction permits.

2. Expertise is important to developing comfort and trust among agencies. Trust is built on respect for the technical competence of other agencies. The NYPD has grown to appreciate the expertise and abilities of traffic agents (now under their control) and of DOT traffic engineers in traffic management and traffic planning. A police sergeant commented that the traffic agents solved a problem of controlling PD, Fire, EMS and other vehicles clogging accident scenes after studies of the problem did not yield a solution. TRANSCOM staff felt that their ability to perform capacity analyses showing the impact of construction conflicts was vital to member agencies accepting their coordination role.

3. High-level champions are important. A senior official at the Port Authority of New York and New Jersey, Lou Gambaccini, championed TRANSCOM's creation nearly two decades ago. Senator Lautenberg of New Jersey was critical to obtaining earmark funding of TRANSCOM's technology program. Bringing new money to the region enabled TRANSCOM to embark on new programs and also gave the organization credibility. Leadership of the N.Y.C. DOT commissioner and a high-level commissioner in the NYPD were critical to setting up a NYPD operations center adjacent to the DOT traffic center in Long Island City.

4. Programs have legs. Successful institutional cooperation in one area spawns cooperation of other operations. For example, coordination of incident management between the NYPD and N.Y.C. DOT led to joint efforts to plan and evaluate signal adjustments in complex intersections such as Herald Square. Coordination also gives rise to the opportunity to put to use for other purposes information generated for one purpose. For example, TRANSCOM's incident detection grew into a highway advisory service utilizing incident information and will be used for travel information services. TRANSCOM also uses congestion data gained from the EZ-Pass speed probes in construction management to reduce lane closures when delays surpass thresholds defined by member agencies.

5. Face-to-face communications greatly enhance agencies' response to major incidents and enrich the possibilities for broader operational coordination. NYPD staff commented that the ability to talk one-on-one with DOT staff helped give staff from both agencies a good feel for what each other could and could not do. The closeness has produced an appreciation for what incident response really entails for each agency and an appreciation of the benefits of cooperation.

6. Current technology facilitates web-like rather than spoke-and-hub relationships between agencies. In the mid-1980s when TRANSCOM was started, incident notification required there to be a central agency to collect and distribute information across a broad collection of agencies. Fiber optic networks, such as the one being undertaken by N.Y.C. DOT, N.Y.C. Transit and MTA B&T, enables each agency to instantly communicate with every other agency in the network without a need to go through a central hub.

7. Funding and designation of a lead agency for funding purposes drive the process. Examples are TRANSCOM funding that added money to the region in the 1980s, and the federal grant to N.Y.C. DOT for video coordination.

8. Access to video feeds has spurred cooperation among New York City agencies. Agencies ranging from NYPD to Sanitation value the video camera coverage of major incidents as the most effective way to decide what type of response to mount. Video gives operations staff the opportunity to look at the problem and dispatch appropriate equipment without having to wait for a field supervisor to arrive at the scene.

Several lessons are specific to setting up and managing a regional coordinating organization:

9. Avoid threatening agencies' autonomy to prioritize and manage capital projects. TRANSCOM staff say that it was vital to their organization's success that member agencies realized that TRANSCOM was not proposing to be a super MPO or capital planning agency. TRANSCOM focused on scheduling and coordination, not capital planning. Member agencies had to agree to schedule changes; these could not be forced on them.

10. Help each member agency focus on management and operations of its own facilities. Provide construction and incident information that helps the agency plan and manage its construction and operations more effectively.

11. Take away barriers to agencies' participation. TRANSCOM went to 24/7 operation after initially being open only during rush hour in order to win the respect of police departments. TRANSCOM provided police departments with pagers when they were not able to purchase pagers on their own, and provided a toll-free 800 number because agencies could not call long-distance (mid-1980s).

DISCUSSION OF KEY ISSUES

(1) What agencies were involved at the start of the TMC inter-jurisdictional process? Why were they selected? What was the role of direct inter-agency relationships vs. multi-agency coordinating committees and the like? How were these relationships structured? Was there a lead agency, and if so, who was it? What were the functions and responsibilities of each agency?

As noted above, agencies that were responsible for highway, bridge and street construction became TRANSCOM members in order to coordinate construction schedules. These same agencies, with the addition of the New York State Police, also coordinated incident management. Other agencies such as numerous law enforcement and emergency services agencies participate in TRANSCOM activities because of the benefits of sharing incident information.

New York City agencies such as DOT, Police, Fire and Emergency Management coordinate on a peer-to-peer basis with the proviso that the Police Department takes the lead in managing the scene.

(2) Why did the agencies participate in this effort? What was the role of need to improve traffic flows? Of a regional vision? Of political forces?

Agency participation in construction coordination and incident management was a response to clear public problems.

With the pick-up of transportation rebuilding programs in the New York area in the early 1980s, agencies unwittingly scheduled construction closures on parallel facilities. These closures combined with growing traffic to create several highly-publicized traffic tie-ups and bad press. The Port Authority created TRANSCOM to avoid parallel closures by identifying potential conflicts and mediating changes to construction schedules by member agencies.

Similarly, the need for incident management was clear from several traffic incidents that resulted in avoidably severe traffic tie-ups.

Coordination among city agencies grew as the Police Department played an increasingly important role in incident management. A key development was the PD taking over traffic enforcement agents from DOT in 1996. Though still considered civilians, traffic agents are under the direct control of the police command and integrated with police operations. Having the police take over this function empowered both the police and the traffic agents. For example, traffic agents can be called to the scene of a fire, water main break or other major incident in a matter of minutes, in time to direct Police, Fire, EMS and other vehicles as they respond to the scene. Traffic agents prove to be much more effective at controlling these vehicles and directing traffic than did police officers themselves.

Another example concerns construction permits. Traffic agents had historically found it difficult to enforce the terms of construction permits, which often limit construction to certain times of the day and limit sidewalk and lane closures. As the PD center next to DOT's traffic center came into being, the PD became more closely involved with enforcement of construction permits. DOT now trains traffic safety officers (one to three per precinct) on how to read the permits. The officers are able to effectively check construction sites and can shut down and summons companies that violate their permits. Fines range up to $8,000. These steps have greatly reduced problems with traffic blockages from construction permit violators.

(3) What was shared—information, facilities, equipment, communications networks? What was coordinated—incident response, traffic signal control, variable message signs, emergency response? Why did coordination take the form that it did? What tradeoffs were involved? Would additional benefits be achieved with additional sharing or coordination arrangements?

Sharing and coordination has occurred in a wide variety of areas as noted above. Coordination began with high-visibility problems and over time broadened to less-visible, day-to-day operational issues such as enforcement of construction permits.

(4) What were the main costs and benefits of coordination?

Each agency feels that the benefits to that agency well outweigh costs, although formal cost/benefit analysis has not been undertaken.

(5) How were the projects funded? How was public, political and institutional support for traffic management systems built?

Projects have been funded by both regular federal-aid programs and by special ITS funding, either from grants to agencies from the ITS program or from Congressional earmarks in federal legislation. N.Y.S. DOT has adopted a policy of installing the ITS infrastructure as part of reconstruction projects and using the ITS capability as part of the maintenance and protection of the traffic component of the project. The area is using federal funds for traffic operations purposes. The programs are basically under the political radar screen with the exception of EZ-PASS which withstood a significant public and political challenge.

(6) What were the catalysts to inter-jurisdictional traffic management? What role did bodies with regional jurisdiction play? Was there a champion who played a critical role? Were funding requirements important? If so, who set the requirements and why? Did the demands of traffic management for special events play a catalytic role?

Highly-visible problems, champions and funding have all been important catalysts. Special event planning has not played a major role in germinating inter-jurisdictional cooperation.

(7) To what extent was coordination a product of planning processes? What was the nature and extent of the planning processes? Who was involved? To what extent did coordination proceed incrementally? What was the experience with each approach used?

Coordination proceeded incrementally although the players had a clear vision of the purposes and direction of the overall effort.

(8) How was trust built between agencies?

Trust was built from recognition of other agencies' expertise, from staff working together across agency lines and from seeing successes of that cooperation.

(9) How were control issues addressed?

With few exceptions each agency maintained control of their own facilities and equipment. One notable exception is that N.Y.C. DOT puts NYPD messages on variable message signs during major incidents. DOT staff explain that the PD has clear responsibility for

incident response should anything occur and on that basis DOT is comfortable with giving over control of message content. (Note that DOT does screen nonemergency messages and has disallowed information such as concert cancellations.)

(10)How were issues of compatibility of communications systems, data formats, etc. dealt with? Was this an important issue? At what point was it resolved?

Compatibility was a very important issue in setting up TRANSCOM information sharing. The TRANSCOM Regional Architecture enables communications among agency systems.

Agencies are currently coordinating technology as they expand fiber optic networks and video and data sharing.

(11)Use of private partners, particularly of interest if traffic information has commercial value.

TRANSCOM has begun using private partners that would distribute travel and traffic information. To date, however, information has been distributed to radio stations and other news outlets at no charge.

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