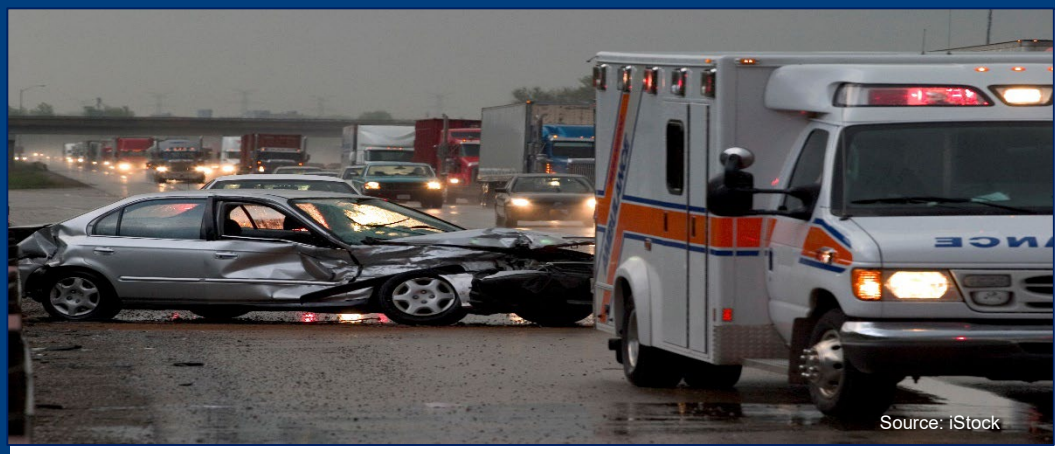
ITS DEPLOYMENT EVALUATION

Executive Briefing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Next Generation Traffic Incident Management

Highlights

- With an average of six million reportable crashes each year that place emergency responders and motorists at risk of secondary crashes, TIM plays a vital role in maintaining safe, reliable travel on our nation's roadways.
- Next-Generation TIM technologies have led to faster incident response and clearance times. The Oro Valley, AZ Police Department found that when officers used TIM practices and tracked time using a CAD system, incident clearance times were reduced by 32 percent.
- UAS have proven to be cost effective when implemented in TIM deployments, especially when used for aerial images. For example, the operational cost for a UAS is $20 per hour, while a helicopter could cost $400 per hour.

This brief is based on past evaluation data contained in the ITS Databases at: www.itskrs.its.dot.gov. The databases are maintained by the U.S. DOT's ITS JPO Deployment Evaluation Program to support informed decision making regarding ITS investments. The brief presents benefits, costs, and best practices from past evaluations of ITS projects.

U.S. Department of Transportation
Intelligent Transportation Systems
Joint Program Office

Introduction

Traffic incident management (TIM) strategies coordinate activity across multiple organizations and systems to detect, respond to, and clear traffic incidents for prompt restoration of traffic flow and improved safety for motorists, crash victims, and emergency responders. With an average of six million reportable crashes each year that place emergency responders and motorists at risk of secondary crashes, TIM plays a vital role in maintaining safe, reliable travel on our nation's roadways. As defined by the Federal Highway Administration (FHWA), the eight stages of TIM are (1) incident detection, (2) incident verification, (3) dispatch and response, (4) scene management, (5) traffic management, (6) motorist information dissemination, (7) roadway clearance, and (8) recovery [1].

Agencies use a variety of Intelligent Transportation Systems (ITS) to detect and verify incidents. These technologies allow authorities to better respond to incidents, manage the incident scene, clear incidents, and provide timely traveler information to motorists. Examples of technologies used to detect and verify incidents include information reported from safety Service patrols (SSPs), information from computer-aided dispatch (CAD) integrations, third-party incident data, traffic data from detection along the roadway, scan from CCTV cameras, and automated incident detection systems.

New technology, data, and training mechanisms are now available to improve incident management. These Next-Generation TIM strategies enable agencies to utilize connected vehicle applications such as navigation-apps like Waze that identify active responders in the vicinity of an incident, notification-based incident detection using crowdsourced data, unmanned aircraft systems (UAS) and more. Program assessment data indicate NextGen TIM has helped state and local agencies achieve meaningful and measurable results by expanding the geographic coverage and information timeliness for incident detection, reducing clearance time, and improving responder and traveler decision making.

Benefits

With improved technology, training, and data collection, Next-Generation TIM emergency response efforts have achieved safer, more reliable roadway operations [2]. The ITS Evaluation Benefits database includes documented benefits on Next-Gen TIM technologies such as Freeway Service Patrols with advanced communication capabilities, Integrated Corridor Management Systems, CAD Integration, UAS, and Responder-to-Vehicle (R2V) Alerts. These technologies have led to faster incident response and clearance times. For example, In 2018, the Oro Valley, Arizona Police Department found that when officers tracked incident response time using a CAD system, incident clearance times were reduced by 32 percent (2023-B01705). Faster response and clearance times helps alleviate congestion and restore traffic flow, while also improving safety for motorists and first responders.

The safety and mobility benefits of traffic incident management programs have been well documented, including reduced congestion, increased efficiency and productivity of local agencies, and increased safety for everyone involved in incidents [3]. UAS helped state and local agencies achieve great efficiency in incident response. In 2018, North Carolina's Department of Transportation UAS program used a UAS equipped with 3-D imaging technology to map a crash scene 95 minutes faster than the traditional method (2018-B01258). This result suggests clearance times could be cut by more than 50 percent while also mitigating danger to first responders. The Washington State Patrol (WSP) has documented more than 125 UAS flights for TIM; the data show that these deployments provided a 75 percent reduction in road closure times, which are estimated to cost $350 per minute. This led to a total of $4,210,500 saved during a 9-month span in 2018 (2023-B01704).

New methods of data collection are another component of Next-Generation TIM technologies. The D.C. Department of Transportation (DDOT) partners with a third-party application provider for data from a real-time crowdsourced traffic and navigation app which is used to estimate the end of incident-related traffic congestion and to communicate with motorists using dynamic message signs. This helps reduce the likelihood of a rear-end collision and gives

Figure 1: Improved clearance times help alleviate congestion and restore traffic flow (Source: iStock).

motorists the option to make safer driving decisions with the use of detours. Additionally, agencies that improve their data collection capabilities can understand the performance and effectiveness of their Next-Generation TIM deployments and improve the planning and management of their deployments accordingly. Data collected by the Georgia Department of Transportation (GDOT) showed that its Towing and Recovery Incentive Program (TRIP), which facilitates improved management of large-scale commercial vehicle incidents [4], reduced clearance times by about 80 percent. The data demonstrates the benefits of the TIM deployment and allows GDOT and other state DOTs to understand the effectiveness of TRIP (2023-B01706). Many agencies have begun implementing dashboards to monitor their performance metrics regarding TIM, making information about the effectiveness of the agency's TIM operations internally and publicly available.

Costs

Agencies are deploying Next-Generation TIM technologies to improve efficiencies and reduce costs. UAS have proven to be cost effective when implemented in TIM deployments, especially when used for aerial imaging. For example, the Washington State Patrol estimates the operational cost for a UAS is $20 per hour, while a helicopter could cost $400 per hour (2022-SC00522).

The ITS Costs Database provides several examples of costs for incident management and emergency response deployments. It is important to note that these deployments do not consist entirely of Next-Generation TIM Technologies but use them to supplement larger projects. For example, an Automatic Vehicle Location (AVL) system integrated with a CAD system was deployed in Clayton County, Georgia with the goal of improving response time to incidents and routing. This deployment had an anticipated cost of $570,337 for equipping a 230 emergency vehicle fleet (2017-SC00374).

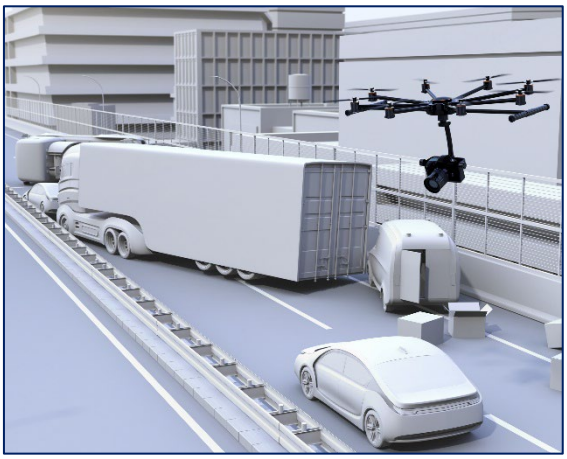

Figure 2: A drone takes aerial footage of a traffic incident involving a truck and three vehicles (Source: iStock).

The Texas Department of Transportation (TxDOT) provides a statewide Transportation Systems Management and Operations (TSMO) standard operating procedures guide which addresses TIM. Table 1 shows costs of selected TIM components based on recent TxDOT and municipal project cost estimates (2022-SC00523).

Table 1: Sample TIM Component Costs in Texas, 2021

TIM Component (2021$)	Initial Cost	O&M Cost
Vehicle Detection and Cameras	$9000/Detection Device	$500 annual
Automated Incident Detection System	$1,000/Camera	$100 annual
Emergency Vehicle Preemption	$4,000/traffic signal	$250 annual
Dedicated Incident Responders	$50/Hour	
Incident Response Vehicles	$60,000/Vehicle	$3,000 annual
Traffic Management Center Employees	$50/Hour	
Travel Information System Integration	$50,000/integration	$1,000 annual
Connected Vehicle Communication Hardware and Software	$5,000/location	$500 annual
Scene Photo Sharing System	$200,000/System	$15,000
Dynamic Message Signs	$125,000/Sign	$5,000 annual

Best Practices

Lack of situational awareness and the inability to communicate leads to delayed emergency response, disruption to traffic flow, and misuse of resources. Sharing of best practices can help agencies get the most out of their Next-Generation TIM strategies.

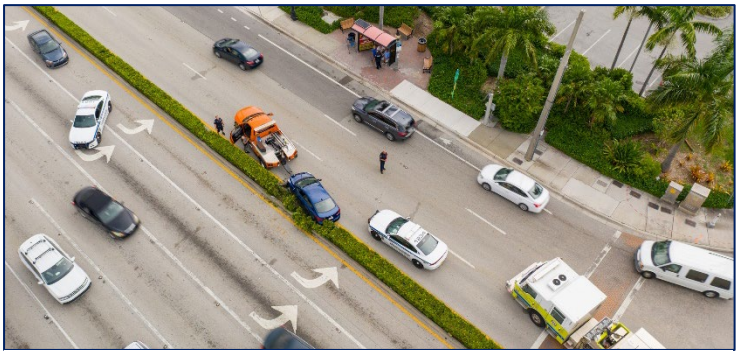

Figure 3: Bird's eye view of a traffic incident response at an intersection (Source: iStock).

Highlighted best practices for implementing NextGen TIM strategies include:

Use of Existing Infrastructure

- Using existing CCTV camera feeds, fiber connection, and mobile applications can lead to a smoother transition when implementing new interoperability platforms. (2023-L01168).

TIM technologies seek to mitigate delayed response and extended clearance times. Restoring traffic flow and keeping motorists safe are key outcomes that are increasingly possible with the correct technologies and procedures in place.

Interoperability

- Implementing an interoperability platform can allowed for coordination between traffic management centers (TMC), communication centers, incident responders, and partner agencies. Creating a direct link between the TMCs and communication centers allows responders and communicators to seamlessly coordinate TIM operations (Figure 3) (2023-L01168).

Data Sharing

- Data dashboards can drive organizational goals by giving real-time analysis and presentations of key metrics, such as secondary crashes and responder struck-by-incidents [5].
- Interagency communication and data sharing, such as video, GPS locations, and files of emergency scenes, can lead to reduced roadway clearance times and congestion and minimized the risk of secondary crashes (2023-L01168).

Developing and Utilizing Models and Algorithms

- Using predictive algorithms help can help agencies predict incident clearance times. This information supports implementing better traffic management strategies and provides accurate traveler information (2022-L01160).
- Developing real-time models can help agencies evaluate the implemented traffic incident response. This also may help agencies identify problematic areas, learn from mistakes, and provide helpful information to other agencies (2022-L01160).

Case Study

In 2018, the City of Bellevue, Washington received 482 emergency calls per day, many of them were related to traffic collisions or led to road closures. The large volume of calls were difficult to manage and time consuming which led to many high priority incidents being left unattended or delayed. To combat this problem, the City of Bellevue, along with the Northeast King County Regional Public Safety Communication Agency (NORCOM), developed an Application Programming Interface (API) dashboard to monitor and help respond to traffic incidents in real time. The API dashboard integrated the traffic cameras already installed in the city to view, record, and capture intersection approaches, which were then displayed on a Geographic Information System (GIS) city map (Figure 4). Operation Engineers monitoring the feed were then able to link with a camera nearby, review the incident, and make incident response decisions based on the severity of the situation [6].

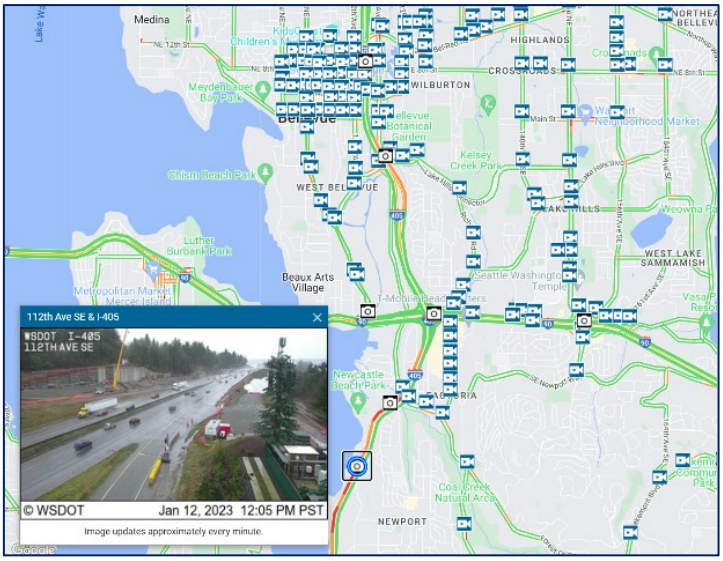

Figure 4: The API dashboard integrates traffic camera feed data to help operation engineers respond to incidents more efficiently (Source: City of Bellevue).

The API dashboard provided a much more efficient process to manage incident response and post-incident assessment by providing instant alerts, location, and access to saved traffic incident footage. With the City of Bellevue's engineers actively monitoring the dashboard and addressing incidents, traffic congestion duration and recovery time has shortened. The engineers were also capable of responding to multiple incidents at once. On average, the dashboard saved 10-15 minutes during the investigative and verification phase of the incident.

References

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