Reducing Road Risk Using Journey Management

Stephanie Pratt, PhD
National Institute for Occupational Safety and Health
Morgantown, West Virginia

Kyla Retzer, MPH
National Institute for Occupational Safety and Health
Denver, Colorado

Derek Tate
Derek Tate Consulting Services
Bragg Creek, Alberta, Canada

Introduction

The risk of motor vehicle crashes associated with on-the-job operation of motor vehicles or exposure to road traffic hazards affects millions of workers in the United States. Fatality data show that across all industries, motor vehicle-related incidents are consistently the leading cause of work-related fatalities, and they are the first or second leading cause in every major industry sector. Of 47,718 work-related fatalities reported by the Bureau of Labor Statistics between 2003 and 2011, 17,037 (36%) were associated with motor vehicles.[1,2] The toll for this 9-year period included:

- 11,305 deaths in single- or multiple-vehicle crashes on public roadways
- 2,709 deaths in crashes that occurred off the highway or on industrial premises
- 3,023 pedestrian worker deaths as a result of being struck by a motor vehicle

Crash-related fatalities and serious injuries have a devastating impact on workers and their families, and on the economic health and productivity of American businesses. For crash-related injuries in 2010 requiring more than 6 days away from work, workers' compensation costs alone were estimated to be nearly $2 billion (Liberty Mutual Research Institute for Safety 2). Work vehicles also have an impact on the safety of the motoring public. For example, although motor vehicle crashes are the leading cause of fatality for truck drivers, these events result in far more fatalities of other road users (FMCSA 64).

Occupational driving differs in several ways from other types of work assignments. First, despite the increasing use of in-vehicle monitoring systems and telematics, it is primarily an unsupervised task. Second, driving is performed in a comparatively uncontrolled environment where the unsafe actions of other motorists put workers at risk. Third, operating conditions can and do change constantly. The driver must monitor and respond to changes in road conditions,

---

[1] Source: Bureau of Labor Statistics online query system at http://data.bls.gov/cgi-bin/dsrv?fi
[2] Data on work-related deaths do not include workers who died in crashes during commutes to work.

weather, visibility, traffic, and the vehicle. A driver can also be exposed to conditions that are quite manageable at the outset, but may become less manageable within a short period of time. Finally, time constraints or task demands imposed by the employer might encourage unsafe driving practices (e.g., speeding or using mobile phones).

Motor vehicle crashes are the leading cause of occupational fatalities for oil and gas extraction workers in the United States, with a fatality rate 8.5 times the rate for all U.S. workers (Retzer, Hill, and Pratt 168, 170). Several features of occupational driving in this industry may contribute to the increased risk of fatality, including driving on rural roads which may lack safety features, long work hours and long distances traveled, and rugged terrain (CDC 431, Retzer and Hill 18-21). Many oil and gas extraction workers have long commutes to their worksite, resulting in additional exposure and risk for crashes. Finally, non-use of seat belts has been identified as a particular risk factor for workers in the oil and gas extraction industry (Retzer, Hill, and Pratt 170).

Journey management is a promising prevention strategy to reduce the total number of miles driven and to reduce the risks associated with road travel. Journey management is accomplished through company policies and procedures that systematically question the need for trips and select the safest routes, driving conditions, drivers, and vehicles for necessary road travel. Because of the risks inherent in driving in the industry, many oil and gas companies have implemented journey management procedures to protect their workers and assets. A systematic review of Society of Petroleum Engineers (SPE) conference papers on motor vehicle safety programs identified 19 articles on this topic between 1990 and 2012 (Retzer, Hill, and Burton 2). All 19 articles reported a reduction in crash rates, injury rates, and/or cost savings as a result of the intervention.

Based on these reports of successful implementation, the International Association of Oil & Gas Producers (OGP) recommends that all oil and gas extraction companies implement a journey management procedure as part of an overall land transportation safety program (OGP 2011a). However, the application of journey management is somewhat limited in the oil and gas industry in the United States, and there appears to be a need for more clarification of journey management and the elements of a journey management procedure.

Journey management appears to be a more mature and widely-recognized concept in high-income countries outside the United States. In these locations, it is advocated for all companies which operate motor vehicles. Professional associations and nongovernmental organizations in the United Kingdom, Australia, and the European Union have issued guidelines containing journey management principles (AFMA 25, 42-43, 153-155; ETSC 23-24; RoSPA 2003 32-43; RoSPA 2011 1-5; HSE 15-17). In addition, journey management is one of five main categories included in a proposed fleet safety management audit tool from Australia (Mitchell, Friswell, and Mooren 116-117).

This paper offers a definition of journey management, places it within a comprehensive road safety management system, explains the difference between journey management and day-to-day trip management, and outlines suggested steps to develop a journey management procedure tailored to a company's driving environment.

Journey Management Defined

Journey management refers to a planned and systematic process of reducing transportation-related risks within a company's operations. The key objective is to minimize unnecessary trips, distances driven, and the risks associated with necessary trips. Journey management contains the following components:

- A formal procedure/policy that contains site-specific assessments of transportation-related hazards and what steps will be taken to minimize these hazards
- A formal process to assess the need for trips and to seek to eliminate unnecessary trips
- A procedure for managing trips, including safe route planning and minimizing driving and environmental risks and the distances driven in a single trip
-

Distinguishing between Journey Management and Trip Management

Many discussions about journey management focus on only one of the three components of journey management: trip management, which is the day-to-day process a supervisor and driver follow when planning and making a trip. Trip management includes pre-trip, trip, and post-trip procedures. Examples include a pre-trip risk assessment checklist, procedures for checking in during the trip, when to take rest breaks, and how to report back to a dispatcher or journey manager upon arrival. Although journey management includes these trip management procedures, it also takes into account the bigger picture of risks for fleet operations enterprise-wide, as well as site and operation-specific factors. A **journey management procedure (JMP)** works with trip management procedures to describe known risks and hazards and specify how they will be managed.

A simple example of journey management in one's personal life might be to look at the week ahead and plan trips to coincide with times and streets with low traffic density. It may also involve combining trips, such as shopping and dropping off/picking up children from school. These approaches to reducing miles driven and exposure to road hazards can be applied in a more systematic, comprehensive way in the workplace through the JMP.

Steps to Developing a Journey Management Procedure (JMP)

A journey management procedure (JMP) should not exist in isolation. It should be part of an enterprise-wide road safety management system, and its success and sustainability depends on, among other things, full management and leadership commitment and accountability. It should be just one component of a comprehensive, tiered program that flows from vision and expectations established at the highest levels of the enterprise. A key advantage of the tiered approach is that it offers the option to progress from communicating expectations for the entire organization to communicating specifications for varied operating environments or regions where different or more intensive actions are needed.

The following sections introduce a seven-step process to help guide a company through the development of a comprehensive JMP that includes controls for all the hazards faced in its operations. Step 1 places journey management within an overall road safety management program, while steps 2 through 7 focus on development and implementation of the JMP. Although some of the examples provided will be specific to the oil and gas industry, journey management concepts can be applied across all industries.

Step 1. Develop a Road Safety Framework

The road safety framework is part of a multi-level system that begins with a top-level vision statement of the company's culture and aspirations for its safety performance, followed by a policy statement that is a more concrete statement of rules and expectations for everyone involved in motor vehicle operations. Standards and procedures (one of which is the JMP), support and add specificity to the policy statement.

Vision Statement

The *vision statement* is a concise statement of core values that establishes expectations for enterprise-wide health, safety, and environment (HSE) initiatives. The following is an example of a corporate HSE vision statement from the oil and gas industry:

> Goal Zero captures the belief that we can operate without fatalities or significant incidents despite the often difficult conditions in which we operate. To support this aim, we continue to roll out initiatives to strengthen our safety culture. This includes improving the safety leadership skills of staff, simplifying our requirements, and rewarding successful performance (Shell Global).

Policy Statement

Policy statements are brief documents that lay out expectations for safety behaviors at the highest level of the enterprise. These expectations align with the core values included in the vision statement, and are frequently applied to contractors as well as employees, especially when contractors and employees work side-by-side. The following list provides a few examples of expectations that might be included in an enterprise-level policy statement specific to motor vehicle operations. The first of these denotes expectations for journey management.

- All trips will be managed to minimize the potential for a crash.
- All occupants of vehicles used on company business will wear seat belts.
- All drivers will drive within the bounds of the law.
- All drivers will be trained to operate their assigned vehicle type.
- All drivers will be alert and fit for duty prior to operating a motor vehicle.
- Mobile phones and other electronic devices will not be used by the driver when a vehicle used for company business is in operation.

Standards

Standards are directly linked to the policy statement for motor vehicle operations because they describe further how the policy-level expectations will be met. These standards are still general enough that they can be applied across the organization in all types of operations involving motor vehicles, and in all areas of the world. For example, standards would be likely to address topics such as seat belts, regulatory compliance, training, fitness for duty, mobile phones, and journey management. A standard for journey management might contain the following elements:

- Each location will have a Journey Management Procedure in place.
- A hazard assessment will be completed for each road to be traveled prior to its use.
- All trips will be risk-assessed and approved prior to commencement.

Procedures

Procedures provide specific methods and instructions to achieve compliance with the standards. The JMP is one of many procedures that will be used to manage exposure to road traffic hazards and the associated risks, and the process of developing the JMP will undoubtedly help to develop

the procedures associated with other aspects of vehicle operations. The challenge of developing procedures is to have them communicate rules or expectations for road safety in such a way that they are not burdensome or functionally impractical for some types of operating environments or areas of the world, while falling short for others. Generally, this balance is achieved through workplace guidance documents, which can be targeted to address specific operating environments or contingencies.

Step 2. Determine Necessary Driving Activities

Clearly, the most effective means of eliminating road risk is to eliminate unnecessary travel by challenging the need for any trip. Several different questions guide this process:

- **Is travel necessary?** It may be possible to meet business needs by conducting meetings via phone, Web, or video conferencing.
- **Is travel by road necessary?** In some instances, it may make better sense to use rail or air, both of which are safer than travel by road. Consideration should also be given to making better use of public transportation.
- **Can multiple needs for travel be met in a single trip?**
- **Is it necessary for my company to do the transporting?** For companies in industries such as manufacturing or agriculture, this will probably involve deciding whether to operate their own transport and distribution networks, or to contract these services to a trucking company. For oil and gas service companies providing well site services, a major consideration is whether to transport equipment themselves or enlist contractors with specialized expertise, such as rig moving companies. For safe operations, contractors such as rig moving companies should also operate under a JMP; this can be specified in contract language.

Step 3. Start a Risk Register

A risk register is the product of a structured risk assessment that identifies the hazards or conditions that have the potential to cause a motor vehicle incident. Although hazards are identified separately for each work activity or task, the process is meant to identify risks common to the whole of the company's operations. This big-picture approach will ensure that high-level procedures will acknowledge and be able to accommodate unusual circumstances when details begin to be addressed. Focusing only on day-to-day travels can lead to a premature and unproductive emphasis on identifying "variations" or "exceptions."

The first steps in developing a risk register are to review the fleet's previous incidents and use input from drivers to help identify common hazards. Then, formulate categories that organize driving-related hazards according to the source of the hazard. Table 1 further delineates the content of categories that could be used to organize a risk register for motor vehicle operations.

Category	Points to consider
Weather	Consider weather conditions that are hazardous. Some examples include areas that frequently experience fog or low visibility, roads that may be prone to ice or snow during winter, stretches of roads subject to heavy cross winds, extreme heat or cold, or frequent freezing and re-freezing.
Roads	Complete a road hazard assessment on each of the primary routes that the company's vehicles travel. A simple yet effective assessment tool calls for one person to drive the road while a passenger logs road hazards at mileage points (OGP 2011b). The hazard log is then reviewed to provide suggested operating procedures to deal with the identified hazards. The finished assessment is then provided to drivers during training and as part of pre-trip planning. The assessment takes into consideration factors such as road

	surface, traction, and sharp curves.
Traffic conditions	Identify local traffic patterns and behaviors that are hazardous, such as high-risk intersections and high-volume roadways. Crash history for major roads may be available through local law enforcement.
Light conditions	Identify local light conditions (e.g., caused by sunrise/sunset, or absence of lighting) that are hazardous.
Personal security and load security issues	List high-crime areas and areas with little or no mobile phone coverage.
Vehicle handling issues	Identify hazards related to each vehicle type in the company's fleet. Hazards may be related to stability, dimensions, maintenance/repair concerns, and load stability. Discuss vehicle types that may require extra knowledge, training and qualification, or diligence when operated, such as vehicles with a high center of gravity.
Driver	Identify driver-related hazards that can result from level of experience, training, licensing and endorsements, fitness for duty, medical status, and other factors.
Load securement	Identify hazards related to cargo and to objects in the cab.

Table 1. In developing the risk register, it is helpful to organize hazards into categories.

After the categories are refined and finalized, the risk register is developed. It contains the following information:

- **Activity:** a job task, or job task step (e.g., driving in winter, driving at night).
- **Category:** a framework for organizing driving-related hazards according to the source of the hazard (Table 1).
- **Hazard:** any substandard act or substandard condition that has the potential to cause an incident (e.g., slippery road, poor visibility).
- **Risk:** the possible undesirable outcome when the Activity is combined with the Hazard. It is also helpful to note the severity of the consequences (e.g., skidding on a slippery road and going into a ditch, striking an animal).
-

Table 2 below provides examples of risk register entries associated with driving in winter.

Activity	Category	Hazard	Risk
Driving in winter	Roads	Slippery roads	Skidding causing crash
	Weather	Extreme cold	Hypothermia in the event of an incident
	Traffic conditions	Other drivers	May travel too fast for conditions and enter driver's lane
	Vehicle	Extreme cold	May cause starting problems
	Driver	High alertness for extreme driving conditions	May lead to driver fatigue causing micro-sleeps

Table 2. Creating a risk register is the first step in a structured risk assessment process.

Step 4: Identify Controls for Risks
After the risk register is completed, the next step is to develop a risk control matrix that builds on the information gathered during the risk assessment carried out during Step 3. The risk control matrix identifies the control(s) a company has already put in place to prevent or mitigate each hazard and/or risk, as well as those that will need to be added. There are five primary control mechanisms that can be considered for inclusion in the risk control matrix. In hierarchical order from most to least effective, they are:

- Elimination (i.e., removing the hazard completely by foregoing unnecessary travel by road)
- Substitution (e.g., using a safer mode of transportation)
- Engineering (e.g., electronic stability control)
- Administrative (e.g., driving restrictions)
- Personal protection (e.g., seatbelts, airbags)

Developing the risk control matrix involves listing all the controls that should be in place to best manage the hazards encountered by the company's operations. Because it allows for identification of controls not yet implemented in the company, this exercise also serves as a "gap analysis." Needed controls can be incorporated immediately, or over a period of time as part of continuous improvement when resources become available. In all cases, the company should strive to develop controls that are practical and that can be implemented and measured for consistency.

Table 3 below shows how the risk register could be extended to create a risk control matrix for the activity of driving in winter.

Activity	Category	Hazard	Risk	Controls	
				Prevention	Mitigation
Driving in winter	Road	Slippery roads	Loss of steering control leading to crash	• Journey management • Reduce speed • In-vehicle monitoring systems • Use 3 peak mountain and snow flake symbol (3PMS) winter tires • Anti-lock braking system (ABS) • Training • Competency assessment • Regulatory compliance, e.g., pre-service inspection	• Seatbelts • In-vehicle monitoring systems • Vehicle design (e.g., NCAP star rating, IIHS rating)[3] • Electronic Stability Control/ABS • Air bags • First aid training • Cell phones/ 911 • Emergency response planning and preparedness • Emergency kit in the vehicle

Table 3. The risk control matrix identifies strategies to eliminate or control identified risks.

Step 5. Create a JMP and Inform Workers

The next step is to bring the vision statement, policy statement, standards, risk register, and risk controls together into one working document, the JMP. Supervisors will use the JMP to manage transportation activities, and the JMP will guide drivers in managing their trips. The JMP is also used, where appropriate, by dispatchers and other operations staff for scheduling work flow and personnel.

---

[3] NCAP denotes New Car Assessment Program; IIHS denotes Insurance Institute for Highway Safety.

If a company has operations in more than one region but operating environments are similar, a single JMP may suffice. In other cases, it may be best to individualize JMPs by region and possibly by operating location. The JMP should be as detailed or as simple as it needs to be. Fleet size is not the overarching criterion for the level of detail in a JMP, although this will probably have some bearing. The deciding factors will generally be the complexity of the risk and the degree of the associated liability.

Following is a suggested outline for a JMP. Whether it is used by a company with a single base of operations, or by a company with multiple operating environments in different geographic areas, the principles are the same. Where local conditions demand it, more detailed guidance documents can be added. For example, operations in desert regions would call for additional guidance to address extreme heat and blowing sand, while operations in North Dakota or Canada would require guidance for winter driving.

1. *Risk profile*
   This initial section describes the operating environment and associated hazards. Content for this section should be based on the completed risk register described above in Step 3.
2. *Regulations*
   This section identifies the regulations that apply to the operation of the company's motor vehicle fleet. While reference can be made to traffic laws and transport and occupational safety regulations at federal, state, and regional levels, it is also important to list county, municipal, and other ordinances and bylaws that may not be as well known, e.g., vehicle dimension limitations, specific operating authorities, road restrictions, noise restrictions, or idling restrictions.
3. *Risk-control interventions*
   This section identifies the interventions from the risk control matrix which have been designated for implementation in order to reduce risk. Depending on local needs and the nature of operations, elements that may be included in this section include:
   - Scheduling to help ensure drivers have dedicated time for adequate rest to comply with hours-of-service rules and be in a condition to drive safely
   - Night driving restrictions
   - Elimination of distractions, including mobile phone policies
   - Route restrictions
   - Load securement practices
   - Specific driver training or competence assessments
   - Vehicle selection requirements
   - Maintenance requirements
   - In-vehicle monitoring system settings and data management practices
   - Trip management procedure and processes (See Step 6)
   - Guidelines for making unscheduled rest breaks or overnight stops due to unforeseen circumstances or fatigue
   - Convoy practices (for situations where moving large numbers of equipment and vehicles together is judged to be most efficient and practical)
   - Orientation of drivers from other operating locations/regions
   - Post-collision procedures and emergency response procedures
4. *Customer/client policies and procedures*
   Here, any specific expectations set forth by customers or clients are listed. This may include delivery times, rules for loading and unloading, and after-hours processes.
5. *Contractor management*
   In this section, reference can be made to:

- Expectations for a contractor's journey management procedure
- Selection and dispatch (this may include a preferred vendor list based on safety performance)
- Limitations of services to be provided by any contractor
- Equipment specifications
- Incident reporting requirements

6. *Management of change/exception process*
   This section specifies what drivers should do when the rules do not fit the situation. It is best to formalize a process before such a situation arises. For smaller operations, this may simply be a call to the operations manager. For larger corporations or higher-risk operations, this may be a more formal process.

   NOTE: Before a JMP and trip management processes are put in place, it is critical that managers, supervisors, and workers be informed about these new initiatives, with emphasis on the purpose and benefits of journey management. A journey management initiative should not be presented as just another set of rules – this runs the risk of supervisors and workers focusing on the potential administrative burden or assuming that journey management might limit their autonomy. Instead, the communications that accompany the introduction of journey management should emphasize the benefits to safety and quite possibly productivity as a result of increased efficiency.

Step 6. Manage each trip: the trip management plan

Each trip should have a plan associated with it. The steps taken in the plan do not necessarily have to be recorded. However, having a documented process within a JMP may be of value for trips having greater risk. This will create consistency in trip execution and aid in any incident investigations and reviews.

Pre-trip Considerations
Journey manager: Each trip should have a journey manager assigned. This is a person who is not participating in the journey and who knows, at a minimum, which drivers are going where, when, and by which route. The journey manager knows when a driver or convoy is delayed and is responsible for initiating some form of emergency response if a driver fails to reach the destination. Frequently, the journey manager is a dispatcher or operations supervisor.

Trip approval: Each trip should require some form of approval. Frequent and routine errands such as local trips around town for parts may have a blanket approval, whereas trips outside the immediate urban area may require specific and elevating levels of approval, based on the destination, the weather conditions, the load and the timing of the trip. Basically, the higher the risk of the trip, the higher the level of approval required.

Risk assessment*:* Assessing risk for an individual trip can vary widely based on the type of trip. The process may be as simple as checking the weather and traffic report on the radio, or it can be quite sophisticated. Once again, ask, "Is this trip necessary?" Trips may be consolidated or other modes of transport considered that reduce the exposure to employees. OGP provides an excellent example of a pre-trip risk assessment tool (OGP 2011c). Consulting with the journey manager where appropriate, the driver needs to assess conditions at the start of the trip and how they may change during the trip, and also consider the potential conditions for the return trip. The weather forecast may be such that delaying the trip is warranted even though conditions at the start are favorable, or plan for a stopover.

Convoys: Although convoys can be an effective mechanism for trip management, they may also create a potential hazard for other road users. The decision to dispatch vehicles in convoy should be reconsidered prior to each trip. In some cases, a large convoy can be dispatched in smaller groups with staggered departure times to ease road congestion.

En Route Considerations
What starts out as a simple trip can deteriorate into an emergency due to poor planning or a lack of situational awareness. Drivers should diligently monitor risks throughout a trip and have a set plan for vehicle load securement checks and inspections. They should also know scheduled rest stops, hours-of-service limitations, contingency plans, and emergency response plans. The driver's use of fatigue management and distraction avoidance principles is important to successful execution of any trip.

Post-trip Considerations
Post-trip activities are as important as any other stage of a trip, and they can have a significant effect on subsequent trips. A trip should be closed out with the journey manager and other drivers should be informed of any new or temporary hazards that may affect them. The driver should report any near-misses experienced during the trip. Road hazard assessments should be updated to include new, more permanent hazards. The vehicle should have a post-trip inspection and supervisors notified of any needed vehicle repairs. The vehicle should be parked in a location that provides security for the vehicle as well as the load. Finally, the driver should know where he or she will go to obtain maximum restorative rest.

Right of Refusal (Stop-work Authority)
Drivers should feel capable and confident that they can safely complete the trip. If they do not feel this way at the start or at any point during the trip, they should be allowed the right to refuse to undertake or continue the trip and be confident of supervisory support for the decision. This right should be discussed in an enterprise-wide JMP, and the trip-specific contingencies for this are a necessary part of any trip management plan.

Step 7. Review the JMP's success
The overall process of journey management needs to be dynamic since the operating environment is constantly changing. Tracking incidents measures the success of a JMP and signals the need for adjustments. The most basic standard for measuring and reporting incidents is to calculate a motor vehicle crash rate per 1,000,000 miles or kilometers driven (OGP 2011d, ANSI/ASSE 37-38). More in-depth analyses by vehicle type, geographic region, operating unit, incident severity, or driver category (e.g., CDL vs. non-CDL) may also be used to identify specific worker groups or work situations where more intensive interventions are needed (Hammer et al. 14-15).There should be an established process for workers to communicate observed hazards, both driving behaviors and driving conditions, to help heighten safety awareness and to suggest possible modifications to the JMP.

Incidents, while unfortunate and undesirable, can provide significant information and feedback on the success of a JMP. A review of each incident will provide valuable insights into ways to improve the JMP and reduce the probability of future incidents. Further, it is important that incident reviews across the organization be aggregated for analysis so that enterprise-wide learning and communication can occur (Reason 195-196).

Managers/supervisors should periodically check in with workers to ensure there is adequate understanding and effective implementation of the JMP. Asking a few key questions of drivers, operations managers, and other employees involved in transportation can be a simple yet

effective method. In addition, it may be of value for supervisors to drive some of the routes and observe drivers in action.

A more formal audit of the JMP may be conducted annually or bi-annually. An independent auditor with experience in journey management may be able to give the most objective assessment. An audit/self-audit tool is available from OGP (OGP 2011e).

Conclusion

The journey management procedure (JMP), a component of a comprehensive motor vehicle safety management program, has been used effectively to reduce motor vehicle crashes in the oil and gas extraction industry. However, despite advocacy and resources from the International Association of Oil & Gas Producers (OGP), many oil and gas extraction companies, particularly in the United States, do not yet have a JMP in place.

Journey management has clear safety benefits. It begins at the highest level in the "hierarchy of controls," elimination of the hazard, by questioning the need for any journey by road, and progresses to consideration of how to meet transportation needs while minimizing exposure to road traffic hazards. Moreover, a robust JMP has several features that will be attractive to top managers. The organization can realize cost savings in a number of ways: reduced fuel costs due to foregone and consolidated trips, reduced wear and tear on vehicles, reduced liability, and increased efficiency. These positive outcomes can also be linked to larger organizational goals related to the environment and sustainability.

The value of journey management is not limited to the oil and gas industry. Journey management principles can be applied in any industry and any operating environment. The process may be less complex for an organization with fleet operations limited to passenger vehicles, but the prospects for reducing injury risk and liability and operating more efficiently are no less important. Further efforts are needed to inform all organizations that operate motor vehicles about the potential safety benefits of journey management.

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health. Mention of company names or products does not constitute NIOSH endorsement.

Bibliography

Australian Fleet Managers Association (AFMA). *Safer Motoring How to Guide.* Melbourne: AFMA, 2008.

ANSI/ASSE. *Safe Practices for Motor Vehicle Operations* (ANSI/ASSE Z15.1-2012). New York: American National Standards Institute, 2012.

CDC. "Fatalities among Oil and Gas Extraction Workers—United States, 2003–2006." *MMWR.* 57(16):429-431, 2008.

European Transport Safety Council (ETSC). *Work related road safety management programmes* (PRAISE Thematic Report No. 9). Brussels: ETSC, 2012.

Federal Motor Carrier Safety Administration (FMCSA). *Large Truck and Bus Crash Facts 2011* (retrieved February 7, 2014) (http://www.fmcsa.dot.gov/facts-research/research-technology/report/LargeTruckandBusCrashFacts2011.pdf).

Health and Safety Executive (HSE). *Driving at Work: Managing Work-related Road Safety* (INDG 382). London: HSE, 2003.

Hammer, B. S., Hinderks, W. J., Pratt, S. G., Ross, P. "Develop and Sustain an Effective Fleet Safety Program—Z15 Can Help." *Proceedings of the American Society of Safety Engineers Safety 2013 conference*, Las Vegas, NV, June 24-27, 2013.

International Association of Oil & Gas Producers (OGP). *OGP Land Transportation Safety Recommended Practice* (Report No. 365, revision 1.1). London: OGP, 2011a.

_____. *OGP Land Transportation Safety Recommended Practice, Guidance Note 1, Road Hazard Assessment.* London: OGP, 2011b.

_____. *OGP Land Transportation Safety Recommended Practice, Guidance Note 2, Journey Management*. London: OGP, 2011c.

_____. *OGP Land Transportation Safety Recommended Practice, Guidance Note 5*, *Common Land Transport Incident KPIs for Motor Vehicle Crashes (MVC).* London: OGP, 2011d.

_____. *OGP Land Transportation Safety Recommended Practice, Guidance Note 6, Questionnaire/checklist Assessment for the Implementation of Report 365.*London: OGP, 2011e.

Liberty Mutual Research Institute for Safety [2012]. *2012 Liberty Mutual Workplace Safety Index* (retrieved February 7, 2014) (http://www.libertymutualgroup.com/omapps/ContentServer?pagename=LMGroup/Views/LMG&ft=2&fid=1138356633468).

Mitchell, R., Friswell, R., Mooren, L. "Initial Development of a Practical Safety Audit Tool to Assess Fleet Safety Management Practices." *Accident Analysis & Prevention.* 47:102-118, 2012.

Reason, J. *Managing the Risks of Organizational Accidents.* Aldershot, England: Ashgate, 1997.

Retzer, K., Hill, R. "Fatal Injuries in the U.S Upstream Oil and Gas Extraction Industry, 2003–2008." *Well Servicing Magazine.* Sep/Oct: 18-21, 2011.

Retzer, K., Hill, R., Burton, J. "A Review of the Literature: Motor Vehicle Safety Initiatives in the Oil and Gas Industry." SPE Americas E&P Conference Health, Safety, and Environment, Galveston, Texas, March 18-20, 2013.

Retzer, K., Hill, R., Pratt, S. "Motor Vehicle Fatalities among Oil and Gas Extraction Workers." *Accident Analysis & Prevention.* 51:168-74, 2013.

Royal Society for the Prevention of Accidents (RoSPA). *Managing Occupational Road Risk: The RoSPA Guide.* Birmingham: RoSPA, 2003.

_____. *Driving for Work: Safer Journey Planner.* Birmingham: RoSPA, 2011.

Shell Global. "Strengthening our Safety Culture" (retrieved February 8, 2014) (http://www.shell.com/global/environment-society/safety/culture.html).

Appendix
Recommended Resources

Federal Motor Carrier Safety Administration
Information on regulatory and voluntary programs for reducing injuries, fatalities, and crashes associated with large trucks and buses.

> Federal Motor Carrier Safety Regulations
> Parts 301 through 399 contain safety regulations for operation of large trucks and buses in interstate commerce in the U.S.

Insurance Institute for Highway Safety
This organization provides vehicle crash test results and a wide variety of educational materials on traffic safety. Its web site also offers useful state-by-state comparisons of traffic safety laws.

International Association of Oil & Gas Producers (OGP), Land Transportation Safety web site:
In addition to the complete OGP 365 report, Land Transportation Safety Recommended Practice, this site provides access to all the supplementary tools and resources linked to OGP 365.

National Institute for Occupational Safety and Health, Motor Vehicle Safety web page
This NIOSH page offers information about current research and provides links to completed research and information resources on all aspects of work-related road safety.

National Institute for Occupational Safety and Health Oil and Gas Safety and Health Program
This NIOSH page offers information about current research and provides links to completed research and information on oil and gas extraction safety and health.

National Safety Council: Safety on the Road web page
NSC provides information on mature drivers, teen drivers, impaired driving, seat belts, speeding, distracted driving, and defensive driving. Of particular value to employers is a freely available Cell Phone Policy Kit.

North American Fatigue Management Program
The result of a partnership between the U.S. Department of Transportation and Transport Canada, this site offers free online training courses and other tools to help employers better manage driver fatigue in their workforce.