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Hazardous Materials Transportation: A Meta-Analysis of State Level Policy and Regulations

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HAZARDOUS MATERIALS TRANSPORTATION: A META-ANALYSIS OF STATE LEVEL POLICY AND REGULATION

THESIS

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Abstract

Every day, over 800,000 hazmat transactions take place across the United States. This segment of transportation is expected to grow at a modest two percent a year for the foreseeable future but differences of regulations between the state and Federal level have been a growing concern for both the government and members of the hazmat industry. A patchwork of often inconsistent permits, registration requirements, and hazmat organizational structures at the state level often create barriers to the efficient means of commerce for hazmat carriers and shippers.

This thesis explores the history of hazardous regulations since de-regulation of the trucking industry and focuses specifically on the past decade of Federal legislation that has contributed to the growing disparity between state hazmat programs and policies. Finally, the events of September 11th, 2001 have changes many laws and legislation pertaining to hazmat and this research portrays the effects of the terrorist attacks at the state level. This research included a meta-analysis approach and also collected empirical data about existing state-level hazmat policies from a sample of seven states. The results are published in the form of charts and interpretive graphical maps designed to show patterns not previously displayed by any other types of research in this area of study.

For My Wife, Mother and Father

Acknowledgments

I would like to express my sincerest appreciation to Major John Bell to whom I owe a great deal of credit for guiding me to this research topic. His guidance, knowledge, and enthusiasm for this subject throughout the research and writing process both encouraged and taught me to relax and let others be more critical of my work instead of myself. I would also like to thank Major Kirk Patterson for providing me with invaluable feedback and taking the time to review and question many relevant points while writing this thesis.

David J. Pastika

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Hazardous Materials Transportation:

A Meta-Analysis of State Level Policy and Regulation

I. Introduction:

Background

According to the Research and Special Programs Administration (RSPA)[1] of the US Department of Transportation (DOT), average daily hazardous materials (hazmat) transactions exceed 800,000 shipments (1:1). In addition, annual tonnage for hazardous materials is expected to grow at a yearly rate of two percent over the next five years (2:1). Hazardous materials transport within the trucking and rail industries only represent a small portion of the overall tonnage percentage, but these shipments and the routing corridors and regulations governing them are coming under increasingly stringent scrutiny from a homeland security aspect.

The Code of Federal Regulations section 49 (CFR 49) contains regulations that address the broad transportation industry, but it wasn't until 1966, when the DOT was established to assume the regulation of hazardous materials from the Bureau of Explosives, that hazardous materials transport was specifically broken out from these broad rules. In 1974, the Transportation Safety Act or Hazardous Materials Transportation Act (HMTA) authorized the DOT to enforce hazardous materials regulations for all modes of domestic transportation. When the trucking industry was deregulated in 1980, the floodgates for competition were opened and many new carriers were able to transport hazardous materials. New competition and more carriers began

[1] The Research and Special Programs Administration was reorganized into the Research and Innovative Technology Administration effective 1 Jan 2006.

transporting hazardous materials and this meant dealing with inexperienced drivers and carriers unfamiliar with the myriad of regulations governing hazardous materials transport.

Nearly a decade after deregulation of the trucking industry, the Hazardous Materials Transportation Uniform Safety Act (HMTUSA) became law in 1990. Congress enacted HMTUSA to clarify the maze of conflicting local, state and Federal regulations. The statute includes provisions to encourage uniformity among different state and local highway routing regulations, to develop criteria for the issuance of federal permits to motor carriers of hazardous materials, and to regulate the transport of radioactive materials (3:1). The act also contains Hazardous Materials Regulation 181 (HM-181) which clearly defines federal and state authority, establishes training requirements for hazmat employees and requires a 24-hour emergency response number to be available for any carrier of hazardous material in case of a mishap. HM-181 comprehensively revises previous hazardous materials regulations with respect to hazard communication, classification, and packaging requirements. In addition, HM-181 also contains several phased regulations. These regulations include mandatory placarding of poison inhalation and inhalation hazards (1 October 1992), segregation of hazardous materials while in transport along with performance packaging requirements (1 October 1993) and universal performance packaging requirements (vibration, leak-proof, pressure, drop and stack testing) for all hazardous materials (1 October 1994) (4:1). As of 1 October 1996, all containers used for packing and packaging hazardous materials for transport must be new. This regulation ensures IDs and labels are applicable to the contents within these containers.

The fallout of September 11, 2001 created the Department of Homeland Security (DHS). Many of DOT's policies and definitions regarding hazardous materials, their transport, licensure and federal regulation jurisdictions fell under scrutiny of DHS. Several regulations and acts such as the Patriot Act of 2001 and HM-223 were created as a result of the increased need for national security. Parts of the Patriot Act and all of HM-223 were directly aimed at hazardous material transportation policies. DOT issued HM-223, which represented a key departure from previously established federal regulation, and published its first final rule on October 30, 2003. After many negative appeals from within the hazmat transportation community, it was enacted on June 1, 2005. While HM-223's policies mainly apply to rail, they are a significant departure from previously established DOT definitions and may pose a similar fate to those in the trucking industry. HM-223 and its implications are described in greater detail in the literature review.

CFR 49, HMTUSA and the regulations contained therein represent the federal regulations imposed on the hazardous transportation industry but there are several other, and often more stringent, layers of regulation at the state and local levels. Individual states may elect to adopt CFR 49 regulations as they are written or modify them to a more rigorous level. Furthermore, states may set policy with respect to: licensing, permits and registration, routing, safe havens (parking of unattended vehicles containing class A or B explosives), and any other special requirements for hazardous material transport within its borders. There is an apparent absence in research with respect to state and local regulations as it applies to hazardous transportation, but recent trends suggest

these regulations are becoming increasingly complex and stringent following the events of September 11, 2001.

Problem

The scope of this thesis focuses on the differences between states with respect to their hazardous transportation policies and to identify compliance patterns as well as explore the states' increasing role in policy formulation and how they affect the transportation environment with respect to shippers and transporters. With all of the levels of regulation in place associated with hazardous materials transport, it is increasingly difficult for transporters and shippers to remain informed and up-to-date on the latest requirements. Interstate transport of these materials is further compounded by the fact that each state requires its own unique set of regulations based upon federal legislation, fees, permits, routing and special requirements. A study of this area of transportation management is needed to amalgamate all aspects of training, licensure, routing, and regulation to identify differences, constraints and best practices. Furthermore, compliance with these regulations needs to be investigated to uncover patterns or perceived barriers to entry or routing at all levels of the transportation of hazardous materials. Finally, an understanding or insight into the ever-changing hazardous transportation regulations needs to be explored so tools or benchmarks can be developed to better inform the hazardous transportation industry in this increasingly regulated environment.

Research Question

Given the current state of hazardous transportation regulations in the trucking industry, it is nearly impossible to keep up with all of the annual revisions and changes of regulation from state to state. If the trend of changing complex state and local regulations is in fact increasing, how are state hazmat regulations becoming more restrictive and would an in-depth analysis of these regulations aid in the understanding and compliance of the complex set of rules currently in place for this industry?

Investigative Questions

1. How have the regulations evolved with the deregulation of the trucking industry?
2. How have the events of September 11th, 2001 changed the way hazardous materials are routed or regulated at the state level?
3. Which states have unique or unusually restrictive hazardous materials transportation regulations?
4. What patterns of similar or incongruent regulations exits amongst states (are there any apparent barriers to entry between bordering states or across regions)?
5. Are the states streamlining the certification processes and regulations amongst themselves or are the rules and regulations becoming more and more complex as new federal regulation is introduced and therefore creating more of a disparity among states?

6. Do any national or regional corridors exit for transporting hazardous materials (preferred routes or obvious corridors established by compatible regulations between counties or states)?

Research Methodology

Methodology for this research consists of several side-by-side comparisons of the regulations from each state and the District of Columbia to form a comprehensive view of hazardous ground transportation regulations at the state level. Comparisons of items such as licensure, permits, fees, routing, safe havens, special requirements and agency information are conducted. In addition, a series of interviews is conducted to garner perceptions about the hazardous transportation regulations trends from state transportation officials. These interviews are constructed to gather specific information needed to compare perceptions of the regulations, their usefulness and effectiveness, and to identify new regulations coming online. Qualitative analysis is conducted on data gathered through the compilation of the aforementioned methods by a series of interpretive maps comparing various statistics by state to discern any patterns.

Scope and Limitations of the Research

The scope of this research is centered around ground transportation with an emphasis on, but not limited to the trucking industry. Rail transportation is also discussed regarding recent regulation attempts to re-route hazardous cargo in certain metropolitan areas. Comparison and analysis of state regulations is confined to the United States to include Washington D.C. International transportation across Mexican

and Canadian borders is not included in the scope of this research. Apparent limitations of this research are the dearth of previous research in this specific area of study and the lack of documented statistics for hazardous material transport at the state level. Statistics such as the number of permits issued to out of state transporters are obtained only by contacting local or state transportation departments and are outside of the scope of this research.

Summary

The transport of hazardous materials is growing at a modest rate as compared to the rest of the trucking industry but more regulatory emphasis seems to be placed on this subset of the industry than any other. Following the events of September 11, 2001, homeland security was and still is at the forefront of many security policies involving sensitive or hazardous materials and the means by which to transport them. Regulation such as HM-223 changes traditional DOT definitions regarding hazardous transportation and opens up the possibility of more strict and convoluted regulation for shippers and transporters throughout the hazardous transportation industry at the state level. By systematically comparing regulatory requirements, hazardous shipping routes, licensure and registration by state, as well as conducting interviews of state governmental officials, This research aims to gain an insight into the pitfalls and roadblocks associated with hazardous transportation and develop a management tool useful to the industry.

II. Literature Review

Overview

The purpose of this chapter is to review some of the background literature that has laid the foundation for hazmat transportation regulation research. The literature review begins with an overview of hazardous materials definitions and class documentation for use in defining hazmat regulation. Then an exploration of the current topics is conducted throughout the hazmat research realm specifically addressing hazardous materials routing and safety research initiatives. Next, a side-by-side comparison of some important hazmat regulations at the federal level with the introduction of several bills over the last decade is introduced. A few key changes to recent hazardous materials regulations are given special mention and discussed in greater detail along with a short analysis of implications to the state regulations. Finally, the literature review focuses on hazardous materials transportation research in respect to state compliance with federal regulations.

Hazardous Materials – Definitions and Classes

Regulations governing the packaging, handling, transport, security, training, and identification are called Hazardous Materials Regulations (HMR). These regulations pertaining to hazardous materials are scattered about the Federal level in various locations. Some important resources are:

> **Environmental Protection Agency Regulations, Protection of Environment, Title 40, Code of Federal Regulations, Parts 240-267 and Part 761:** Provides specific guidelines for management of hazardous wastes and substances.
>
> **Federal Motor Carrier Safety Regulations, Title 49, CFR, Parts 390-399:** Contains regulations on matters affecting safety in transport over public highways. Includes specifications for vehicles and drivers.

North American Emergency Response Guidebook, RSPA P 5800.7: A guidebook developed by DOT for first responders during the initial phase of a hazardous materials/dangerous goods incident.

Transportation, Title 49, CFR, Parts 100-199, and DOT exemptions: Contains criteria and requirements for classifying, describing, packaging, marking, labeling, shipping, placing placards and transporting hazardous materials for commercial carriers by all modes/methods of transportation within the United States.

As outlined in 49 CFR, hazardous materials are categorized into nine distinct classes comprised of: Explosives, compressed gasses, flammable liquids, flammable solids, oxidizers, poisons, radioactive materials, corrosive liquids, and other miscellaneous hazardous materials (5:1). In addition, hazardous classes are further broken down into class divisions with each division having its own set of special conditions and placards. A detailed list in Appendix A expands upon the brief mention and visual representation of the placards for each hazard class, introduces accompanying divisions, and also identifies each corresponding CFR associated with the hazard. Besides correctly identifying and preparing hazardous materials for shipping, there are several requirements and responsibilities that fall upon a hazmat shipper before material can be transported. These requirements can be found in 49 CFR Part 173 and include:

PROPER SHIPPING NAME (PSN) - standard name used in the transport of dangerous goods to identify the dangerous article or substance on the outside of the package and on the shipping papers; Proper Shipping Names are listed in the Hazardous Materials Tables in all modal regulations.
CLASS OR DIVISION - number assigned to the article or substance according to the criteria of one or more of nine UN hazard classes.
SHIPPING PAPERS - shipping orders, bills of lading, manifests or other shipping documents serving a similar purpose and containing hazardous materials descriptions and shipper's certification.
CERTIFICATION - the act of confirming that a completed package, marking inclusive, meets the requirements of UN Performance Oriented Packaging.

COMPATIBILITY TEST - test to assure that the plastic material used in the manufacture of plastic drums, plastic jerri-cans, and plastic composite packaging in direct contact with the hazardous material is resistant to chemical reactions.
MARKING - descriptive name, identification number, instructions, cautions, weight, specification, or UN marks, or combinations thereof, required on outer packaging of hazardous materials.
PACKAGING - receptacles and any other components or materials necessary for the receptacle to perform its containment function.

In addition to identifying each hazard class via placards on trucks, rail and other means of transport, shippers also need to take into consideration compatibility of each type of hazard as well as compatibility within each hazard class division when packing and transporting hazardous materials. Compatibility within and between each hazard class is omitted for simplicity for the scope of this thesis. A brief description and visual snapshot of placards for each hazard class and corresponding references to 49 CFR are as follows:

Class 1 Explosives - *49CFR 173.50*

Figure 1. Class 1 Explosive Placards (Barbalace, 2005)

Class 2 Compressed Gasses - *49CFR 173.115*

Figure 2. Class 2 Compressed Gas Placards (Barbalace, 2005)

Class 3 Flammable Liquids - *49CFR 173.120*

Figure 3. Class 3 Flammable Liquid Placards (Barbalace, 2005)

Class 4 Flammable Solids - *49CFR 173.124*

Figure 4. Class 4 Flammable Solid Placards (Barbalace, 2005)

Class 5 Oxidizers - *49CFR 173.127*

Figure 5. Class 5 Oxidizer Placards (Barbalace, 2005)

Class 6 Poisons - *49CFR 173.132*

Figure 6. Class 6 Poison Placards (Barbalace, 2005)

Class 7 Radioactive Materials- *49CFR Subpart I*

Figure 7. Class 7 Radiological Placards (Barbalace, 2005)

Class 8 Corrosive Liquids - *49CFR 173.136*

Figure 8. Class 8 Corrosive Placards (Barbalace, 2005)

Class 9 Miscellaneous - *49CFR 173.140*

Figure 9. Class 2 Misc. Placards (Barbalace, 2005)

Current Topics - Hazmat Routing and Safety Initiatives

Starting with a broad view of hazardous materials and transportation research, the available literature provides an abundance of case studies, thesis publications, journal articles, and other research papers. The literature seems to be divided roughly into three areas dominated by hazmat routing and followed by hazmat safety studies. The third category is a potpourri of research that includes hazmat training, compliance and effectiveness studies, and hazmat incident reporting investigations. Hazmat routing and

safety research literature is important to hazardous materials regulation as it permeates nearly every aspect of the 49 CFR and helps provide the lattice upon which this thesis can grow and branch out.

Hazmat routing is a critical factor to consider in hazmat logistics (6:2). Many communities express a common attitude when hazmat route planning becomes public policy referred to as NTMBY (Not Through My Back Yard) (6:2). Following September 11, 2001, hazmat routing has become an increasingly contentious issue for states, cities, and local communities. With the passage of HM-223, some communities like Washington, D.C. and Cleveland, OH have enacted state and local legislation previously pre-empted by federal regulations to block the routing of certain hazardous materials through their cities. A further discussion about HM-223 and routing is discussed later in this chapter.

Many routing issues focus on risk avoidance, risk modeling, and other minimization techniques and thus we see risk represented in several forms throughout the literature. Expected consequences (Erkut and Verter) (7:590), population exposed to consequences due to impact (Batta) (8:85), incident probability (Saccomanno) (9:12), and probability of first incident (Abkowitz) (10:33) studies have all been conducted with respect to risk (Akgun, et al. 2) (6:2). Solving and proposing routing problems is achieved through several methods. Erkut and Verter have utilized various methods and models throughout their research but this literature review will only refer to them as they contribute a wealth of knowledge to this field of study in excess of what could be expounded upon in this review (11:777). Abkowitz and Cheng incorporate risk as a cost into their model for optimizing the routing of hazardous materials (10:35). Batta and

Chiu created a model with the objective function to find the minimized total of weighted sums through which a vehicle travels in respect to population centers (8:87). Akgun, Parekh, Batta, and Rump also extended risk specifically to the trucking industry and studied the effects of weather systems on least risk path route selection (6:3).

The other major piece of hazmat transportation research is found in reviewing the safety and security aspects of hazardous material research. Minimizing risk and the use of routing are also predominant forms of research in this area. Luedtke and White express concern that hazmat vehicles could be used as platforms to attack vulnerable sites. Furthermore, they agree that routing decisions are needed that minimize the probability of a successful attack (12: 1). Sivakumar et al. propose a conditional risk model upon which they assume hazmat will be repeatedly shipped along a particular route until an incident occurs (13:22). Sherali et al. utilizes similar logic but apply it to a branch and bound solution method and perform a case study to discuss proper collection methods for hazmat data (14:241). Marianov and Revelle consider only probability and cost as factors to construct a simple linear model for hazmat safety (15:158) while Nozick et al. introduce scheduling as well as routing in determining and minimizing risk and security in their hazmat routing heuristics to develop multi-criteria shortest path algorithms (16:205).

Federal Hazardous Materials Legislation

While the topic of hazardous transportation and regulation as it pertains to the trucking industry is diverse and worthy of study from many different aspects, research in this area is virtually non-existent. This section of the literature review will focus on the evolution of federal hazmat regulations over the past decade as well as focus on the

changing environment of regulatory policies in response to increased security measures post 9/11.

The trend of federal legislation of HMRs over the past ten years has been one of increasingly frequent changes and more stringent rules and regulations. A review of a 1986 handbook for state and local hazmat transportation activities revealed that since the Hazardous Materials Transportation Act (HMTA) of 1974, changes to the HMR remained largely unchanged for over a decade (17:3). The number of changes to the HMR over the past decade is especially evident following the events of September 11, 2001 where the current law is now just beginning to reflect some of the post 9/11 legislative passages.

The largest impact from this new legislation has been felt by the trucking industry in the form of new hazmat commercial driver's qualifications. New rules regarding the Federal licensure procedures took effect January 31st 2005 and include many changes that are disheartening to the already strained pool of available transporters. Automatic disqualifications to obtaining a hazmat endorsement include: espionage, sedition, treason, terrorism, and murder (18:23). Additionally, kidnapping, rape or aggravated sexual abuse, extortion, identity fraud, bribery, smuggling, or immigration violation convictions in the past seven years or incarceration for these crimes in the preceding five years also disqualifies potential drivers (19:25). The Transportation Security Administration concurs with trucking industry analysts that up to 540,000 of the current 2.7 million hazmat endorsed truckers could be affected by this new legislation (18:23). Furthermore, many other truckers may opt not to renew their hazmat endorsements due to the myriad of expenses for background checks, information collection fees, threat assessment

checks, and FBI background checks. Adding another layer of complexity to the whole process are the states themselves. Since transporters renew or apply for their hazmat endorsements through the state they identify as their home or base state, transporters must abide by their particular state's rules regarding endorsement. As long as the state's Commercial Drivers License Hazardous Material Program is approved by the DOT, the states may conduct their programs in any manner they choose. This is in direct contrast to the efforts the Federal hazmat legislation has been slowly working towards since de-regulation.

Figures 10, 11, 12, 14, 15, and Appendix B display a side-by-side comparison of several key changes made throughout the past decade to the federal hazmat transportation law (as found in the Federal Safety Reauthorization Acts)[2]. Federal Safety Reauthorization Acts are usually published every two years and update safety and other environmental issues involving transportation. This review will point out some important legislation changes as they have occurred and what impacts they have had on not only the hazardous trucking industry but also the effects levied upon the states' right and/or ability to enact their own hazardous materials transportation policies. A full comprehensive table comparing current law (Safety Reauthorization Act of 2005) to Administration Bills from 1997, 1999, and 2001 is located in Appendix B (20:1). Data from the 2003 Safety Act reflects negligible changes to hazmat transportation policies from previous and subsequent acts and therefore is not included in this comparison.

[2] Specifically, changes dealing with hazmat legislation are referred to as HMRs, the broader governing document is the Federal Safety Reauthorization Act.

Federal Hazardous Materials Regulations: Key Changes

This review will now turn its attention to the changes that have occurred over the past decade or so in the interpretation and publication of the Hazardous Material Regulations. The Safety Reauthorization Act of 2005 serves as the current law on the left of the figures shown in this section and is compared to Acts from 1997, 1999, and 2001 to illustrate some key changes to Federal legislation that have occurred over this time period. Particular attention is given to the issue of pre-emption and states' rights and shows the evolution of this topic over the past decade.

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5102. Definitions. "Commerce" means trade or transportation...	Adds "on a United States registered aircraft"	Same changes as in 1997 Administration bill	Same proposed change as in 1997 and 1999 Administration bill
§5102. Definitions. "Hazmat employee" (1) includes an individual employed by a hazmat employer or who directly affects hazardous material transportation safety (2) includes owner-operator of motor vehicle (3) includes individuals who perform various hazmat functions, including manufacture, recondition, or test containers, drums and packagings and preparing hazmat for transportation	(1) Also includes individuals who are self- employed (2) Deletes "who during the course of employment directly affects hazardous material transportation safety as the Secretary decides" (3) changes preparing hazmat for transportation to "performs any function pertaining to the offering of hazardous material for transportation"	(1) Also includes individuals who are self-employed (2) In addition to including owner-operator of a motor vehicle, includes owner-operators of a vessel or aircraft (3) Under individuals who perform hazmat functions, includes those who also designs and inspects packaging, or a component thereof (4) changes preparing hazmat for transportation to "prepares or rejects hazardous material for transportation"	The definition of "hazmat employee" is amended to: (1) include persons who are used by a hazmat employer. (2) include an owner-operator of a vessel or aircraft, in addition to an owner-operator of a motor vehicle, transporting hazmat in commerce. (3) delete the list of hazmat activities that subject a hazmat employee to regulation and, instead, refer to activities regulated by the Secretary under 5103(b).
§5102. Definitions. "Hazmat employer" (1) A person using at least 1 employee in connection with transporting hazmat in commerce or causing it to be transported in commerce (2) includes owner-operator of a motor vehicle transporting hazmat (3) includes employers who perform hazmat functions,, including causing hazmat to be transported in commerce and a person manufacturing, reconditioning or testing containers, drums or packagings represented as qualified for use in transporting hazmat (4) Includes a department, agency or instrumentality of the US govt...	(1) Also includes a person who is self-employed	(1) Also includes a person who is self-employed (2) Includes owner-operator of a motor vehicle, vessel, or aircraft (3) Under individuals who perform hazmat functions, includes a person performing a function in connection with "rejecting hazardous material for transportation in commerce" and includes those who also design and inspect packaging, or a component thereof (4) deletes "includes a department agency or instrumentality of the United States government...."	The definition of "hazmat employer" is amended to include: (1) a person who has at least one hazmat employee; or (2) a person who is self-employed, including an owner-operator of a motor vehicle, vessel, or aircraft transporting hazmat in commerce; and (3) who performs an activity regulated by the Secretary under § 5103(b).
§5102. Definitions. Motor carrier. Includes a motor carrier, motor private carrier and a freight forwarder.	(1) Includes a motor common carrier, motor contract carrier, motor private carrier, and freight forwarder. (2) Limits the inclusion of a freight forwarder to only those performing a function related to highway transportation	(1) Same as present law BUT (2) Limits the inclusion of a freight forwarder to only those performing a function related to highway transportation	Same proposed changes as in 1999 Administration bill

Figure 10. Section 5102 Bill Comparison (DOT, 2005)

Starting with the current law, Section 5102 (Figure 10) changed the definitions of Hazmat employee, Hazmat employer and Motor carrier from previous legislation and affects the interpretation of Section 5107 (Figure 12). It is clear that even over the past

decade, the definitions of Hazmat employees, employers and carriers have changed considerably to include more and more individuals associated with hazardous materials. A key consideration for this legislation is the issue of training. The available literature on this issue seems to suggest the current definitions are a result of a surplus of funds held by the DOT's former Research and Special Programs Administration (RSPA) through its Hazardous Materials Emergency Preparedness (HMEP) and Motor Carrier Safety Assistance Grant (MCSAP) Programs.

> Since 1992, the Research and Special Programs Administration (RSPA) has conducted a National registration program for persons who offer for transportation or transport certain hazardous materials in intrastate, interstate, or foreign commerce, under the mandate in 49 U.S.C. 5108. The purposes of the registration program are to gather information about the transportation of hazardous materials and fund the Hazardous Materials Emergency Preparedness (HMEP) grants program that supports hazardous materials emergency response planning and training activities by State, territorial, tribal, and local governments.
>
> Approximately 3.2 million firefighters, emergency medical technicians, law enforcement officers, and other responders comprise the nation's emergency response community. Since 1992 over 800,000 emergency responders have been trained, in part, using funds from the HMEP Grants Program. New changes to the registration fee policy went into effect February 14, 2000, adopting a two-tiered fee schedule. As a result, RSPA has collected more than $21 million in each registration year since 2000. These collections have created an unexpended balance in the HMEP Fund because the current annual grants program obligations are limited to the $14.3 million designated by Congress. Therefore, effective March 3, 2003, RSPA will temporarily lower the registration fee for six registration years. In addition, not-for-profit organizations, regardless of size, will pay the same fee as a small business. This reflects SBA's replacement of the Standard Industrial Classification (SIC) code system with the North American Industry Classification System (NAICS). (21:1).

§5105. Transporting certain highly radioactive material. Includes a provision for a routes and modes study	Includes a provision for a routes and modes study	Deletes the provision for a routes and modes study	Deletes (d),which requires a routes and modes study Deletes (e), which requires the Secretary to issue regulations for the inspection of motor vehicles transporting certain hazardous materials

Figure 11. Section 5105 Bill Comparison (DOT, 2005)

Section 5105 (Figure 11) of the current HMR places the provision for a radioactive materials route and mode study back into the legislation. This provision along with Section 5112 (highway routing of hazmat study) has seemed to appear and disappear every other Safety Reauthorization Act amendment. No formal evidence was uncovered in conducting this research to suggest the reason why but it may be a reflection of yearly budgetary constraints. In April of 1998, the DOT issued a long anticipated report addressing the selection of radioactive hazardous materials transportation routes (22:1). The study was mandated by Congress as part of the Hazardous Materials Transportation Uniform Safety Act of 1990 and was entitled Identification of Factors for Selecting Modes and Routes for Shipping High Level Radioactive Waste and Spent Nuclear Fuel. It was prepared by the John A. Volpe National Transportation Systems Center for the U.S. DOT and included highway, rail, water and intermodal transport options. The study did not specifically identify or choose the safest routes or corridors for transporters to follow; rather it concluded that there is a sizable variation in the values of primary safety factors across different mode and route combinations, indicating that mode and route choices made by shippers and carriers can affect shipment risks (23:1). Furthermore, the report concluded that the affected, state, local and tribal governments in conjunction with the US Department of Energy need to establish criteria and standards for developing routes rather than the carriers themselves.

Guidelines for radioactive and non-radioactive hazmat routes are largely defined by individual states. The DOT has established the National Hazardous Materials Route Registry (NHMRR) to act as a repository to share information and to promote prudent route planning by tasking state governors and tribal leaders to designate a routing agency

(24:1). Routes proposed by each state and tribal routing agency are expected to follow Guidelines for Selecting Preferred Highway Route Controlled Quantity Shipments of Radioactive Materials (RSPA-HMS-92-02) authored by the former RSPA or Guidelines for Applying Criteria to Designate Hazmat Routes (FHWA-SA-94-083) authored by the Federal Highway Administration. Both publications are available for download on the Federal Motor Carrier Safety Administration's website. Since the NHMRR began collecting routing information in December 2000, all but seventeen states have designated routing agencies and published routing restrictions. Alaska, Connecticut, Hawaii, Kansas, Maine, Missouri, Nevada, New Hampshire, New Jersey, North Carolina, North Dakota, South Carolina, South Dakota, Vermont, Washington, West Virginia, and Wisconsin have not designated formal routing agencies (24:1).

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5107. Hazmat employee training requirements and grants (d) Coordination of training requirements. ...The Administrator of the EPA, the Secretaries of Labor and Transportation shall ensure that the training requirements do not conflict or duplicate...the regulations the Agency prescribes related to worker protection standards (e) Training grants. Funds shall be available under §5127(c)(3) (f) Relationship to other laws. (2) "An action of the Secretary of Transportation under ... sections 5106, 5108(a)-(g)(1) and (h), and 5109..."	(f)(2) Alters the sections to exclude 5106 and read "5108(c)-(g)(1) and (h) or 5109..."	(d) Deletes the words "or duplicate" and specifies that the "Agency" is the "Administrator of the Environmental Protection Agency" (e). Deletes "§5127(c)(3)" and inserts "5129(b)(1)"	Deletes "or duplicate" in (d) In (e), changes "5127(c)(3)" to "5128," to reflect that the appropriations section has moved In (f)(2), deletes "section 5106, 5108(c)-(g)(1) and (h), and 5109" to clarify that DOT and OSHA share jurisdiction over hazmat employee training only [Section 8 of the Administration bill would clarify that OSHA retains authority over hazmat employee training and the occupational safety/health protection of employees responding to a hazmat release.]

Figure 12. Section 5107 Bill Comparison (DOT, 2005)

As referenced in Figure 12, Section 5107 under the current law expands the number of personnel that are considered subject to hazmat employee training requirements. The Safety Reauthorization Act of 2005 went into effect on 9 January 2006 and according to the Office of Hazardous Materials Safety:

> The definitions of "hazmat employee" and "hazmat employer" would be amended to clarify the applicability of the training requirements in section 5107. To eliminate ambiguity in the current training requirements, the two definitions would be amended to clearly require hazmat training for self-employed persons, including owner-operators of motor vehicles, vessels, or aircraft transporting hazardous materials in commerce. The two definitions also would be amended to clarify the applicability of the training requirements to persons "used" by a hazmat employer -- such as contractors -- to perform any of the hazardous materials functions listed in section 5103(b)(1).
>
> The definition of "motor carrier" would be amended by clarifying that it includes a freight forwarder, as defined in section 13102 of title 49, only if the freight forwarder is performing a function related to highway transportation. Provisions applicable to motor carriers should not apply to freight forwarders performing functions not related to highway transportation. (21:1).

Changes to these definitions may appear slight to those outside the hazmat industry, but have profound impacts on companies dealing with hazardous materials due to training requirements and expenses. The Hazardous Materials Emergency Preparedness Grants Program (HMEP) disburses most of the funds collected by the federal hazmat registration program back to state and tribal agencies to conduct state and local hazmat training. Figure 13 displays the monetary outlays of the HMEP Program for FY 03. In addition, Tables 4, 5, and 6 in Appendix C display grants disbursed to individual states, tribes, and US Territories for 2003, 2004, and 2005.

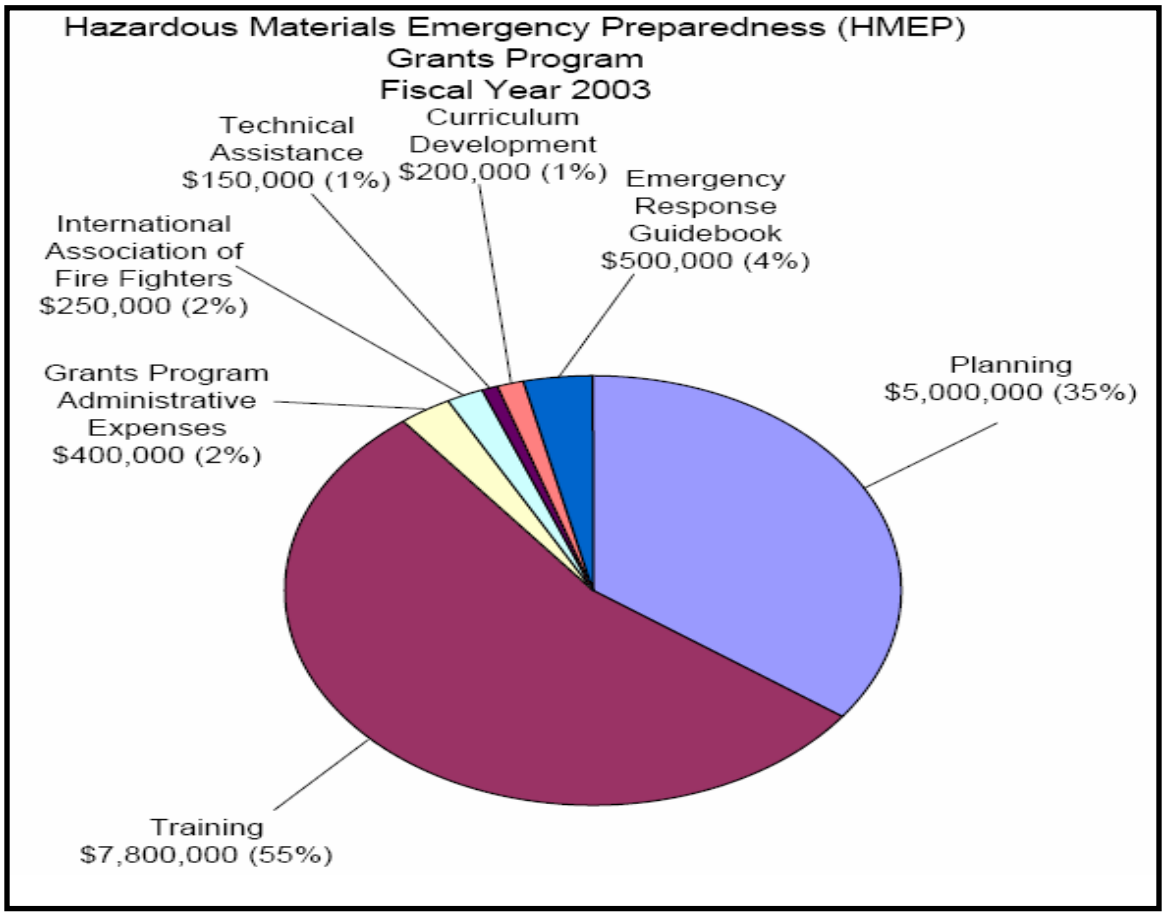

Figure 13. HMEP Grant Program Allocation (DOT 2005)

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5108. Registration. (b)(1)(C). "each State in which the person carries out the activity." (c)(1). Filing deadlines and Amendments. Each person required to file, "must file that first statement not later than 3/31/92. The Secretary may extend that date to 9/30/92, for activities referred to in subsection (a)(1) of this section. A person shall renew the statement consistent with regulations the Secretary prescribes, but not more than once each year and not less than once every 5 years." (c)(2) "The Secretary of Transportation shall decide by regulation when and under what circumstances a registration statement must be amended and the procedures to follow in amending the statement." (g)(2)(A) Fees. "...the fee shall be at least $250 but not more than $5000 from each person..." (g)(2)(A)(viii) "...the amount to be made available to carry out sections 5108(g)(2), 5115, and 5116 of this title." (g)(2)(B) "The Secretary of Transportation shall adjust the amount being collected to reflect any unexpended balance in the account established under 5116(I) of this title. However, the Secretary is not required to refund any fee collected under this paragraph." ...	(b)(1)(C) "each State in which the person carries out any of the activities." (c)(1) Filing Schedule -- Each person required to file, "shall file that statement annually in accordance with the regulations issued by the Secretary."	(b)(1)(C) Same as 1997 (c)(1) Filing Schedule -- Each person required to file, "shall file that statement in accordance with the regulations issued by the Secretary." (c)(2) Deleted (g)(2)(A) "...the fee shall be at least $500 from each person..." (g)(2)A)(viii) "...the amount to be made available to carry out chapter 51 (except sections 5109, 5112, and 5119) of this title." (g)(2)(B) Revises section to read "At the beginning of each fiscal year, the Secretary of Transportation shall publish a fee schedule for the fee established under this paragraph. The fee schedule shall be designed to collect the following amounts." (g)(2)(C) Deletes language in present law and inserts "The Secretary shall transfer to the Secretary of the Treasury all funds received by the Secretary under this paragraph, except the amounts appropriated to RSPA pursuant to subsection 5129(a)(2), for deposit in the account the Secretary of the	In (a)(1)((B), updates terminology used to reference certain hazmat In (a)(2)(B), adds persons who design or inspect hazmat packagings to the list of persons subject to registration requirements. Deletes persons who "fabricate" – term is redundant with "manufacture" and "design" Makes editorial change to (b)(1)(C) Deletes (c)(2) and revises (c)(1) to reflect that registration statements must be filed in accordance with the HMR Makes editorial changes to (g)(1) Amends (i) to exclude Indian tribes from the registration requirements
(§5108 cont'd.) (g)(2)(C) "The Secretary of Transportation shall transfer to the Secretary of the Treasury amounts the Secretary of Transportation collects under this paragraph for deposit in the account established under 5116(I) of this title." (i)(2)(B) The section does not apply to an authority of a State, or political subdivision of a State...		(§ 5108 cont'd) Treasury established under section 5116(I) of this title." (g)(2)(D) Adds a section discussing fees collected under (g)(2)(B)(ii). (g)(2)(E) Adds a section telling the Secretary to adjust the amount being collected under 5108(g)(2)(B) to reflect any unexpended balance in the account established in 5116(I) (i)(2)(B) The section does not apply to "an authority of a State, Indian tribe, or political subdivision of a State..."	

Figure 14. Section 5108 Bill Comparison (DOT 2005)

Section 5108 as it is written in the current HMR merely changes the previous legislation to reflect the DOT's plan to reduce its monetary surplus (created by the federal hazmat registration program) over the next several years by lowering the fees levied at the national level. Table 6 in Appendix C shows the new fee scale prescribed by the DOT for hazmat operators under the federal registration program. A change in policy that went into effect in February 2000 created a two-tiered fee system based upon business size. This policy resulted in RSPA collecting fees in excess of what they spent on training programs and resulted in a budgetary surplus. It is important to note

individual states are not restricted by the amount and types of fees collected at their respective state and local levels.

§5119. Uniform forms and procedures (a) Working Group. "....The purposes of the working group are -- (1) to establish uniform forms and procedures for a State – (A) to register persons that transport or cause to be transported hazardous material by motor vehicle in the State."	No changes	(a)(1)(A) After register adds "and issue permits to"	Revises (a)(1) to allow the Secretary to issue regulations to establish uniform forms and procedures for a state to register and issue permits to persons transporting hazmat or causing hazmat to be transported in motor vehicles in the state or allowing hazmat transportation in the state Revises (a)(2) to prohibit the Secretary from establishing a limit on state registration fees
(c) Regulations on recommendations			Revises (b) to: (1) establish a one-year effective date for regulations prescribed by the Secretary under this section (2) permit an extension for good cause (3)limit state requirements to those that are the same as the Federal requirements
		(c) Adds a fourth recommendation – "Pending promulgation of regulations under this subsection, States may participate in a program of uniform forms and procedures recommended by the working group under subsection (b)."	Deletes existing (c) and proposes a new (c) that requires the Secretary to develop procedures for eliminating differences in how states carry out a regulation prescribed by the Secretary under this section
(d) Relationship to Other Laws.			Deletes existing (d) and proposes a new (d) that permits states to participate in a program of uniform forms and procedures pending the issuance of regulations under this section

Figure 15. Section 5119 Bill Comparison (DOT 2005)

Section 5119 of the current HMR does not change much from the previous versions of legislation but it does propose uniform forms and working groups between states be established for the purpose of streamlining the registration processes between states. The main reason Section 5119 is so important is that in the 2001 legislation, several key rights of the states' were altered or taken away. First, the Secretary of Transportation was given the right to issue regulations to states to cooperate in a uniform state hazmat registration program[3]. Secondly, the 2001 legislation limited state requirements to those that are the same as the Federal requirements. From the scarce amount of sources available on state hazmat legislation compared to the Federal level, it

[3] The proposed uniform state hazmat registration program is different from the existing federal registration program which funds the HMEP Grant Program.

is doubtful that this legislation had a large impact on state hazmat regulations as the trend seems to point at the majority of states adopting Federal guidelines as their own (25:1). Finally, the task of developing new procedures for eliminating the differences on how states carry out regulation prescribed by the Federal legislation rests with the Secretary of Transportation. A concession to limiting state control of hazmat programs is perhaps the removal of the limit to the fees an individual state can assess for hazardous materials transportation permits and licenses but, with current hazmat legislation pushing toward state cooperation, even that concession has strings attached.

This legislation trend hearkens back to 1990 when Congress was on the verge of replacing state hazmat registration programs with a one-size-fits-all federal hazmat registration program (26:1). States and hazmat truckers found themselves at diametrically opposing ends of the spectrum with the states not wanting to be pre-empted by potentially weaker federal law and truckers seeking to escape the 80 plus programs in 42 states (26:1). A compromise was reached in 1994 with states agreeing to establish a working group whereby state officials would create uniform procedures, forms, and licensure programs based upon best practices of existing state programs (26:1). Minnesota, Nevada, Ohio, and West Virginia piloted the test program in 1994-1995 and Illinois, Michigan, and Oklahoma followed suit shortly thereafter. To date, only the seven original states have joined what is known as the Alliance for Uniform Hazmat Transportation Procedures set up by the Federal Motor Carrier Safety Administration. To encourage more states to join, the Uniform Alliance grants incentives of up to $30,000 per state and were available until February 15, 2006 (26:1).

To simplify the registration process amongst Alliance states, the uniform program utilizes the "Double Apportioned" fee formula which is based upon the International Registration Plan (IRP). The IRP is a program for licensing commercial vehicles (trucks and non-chartered buses) in interstate operations among member jurisdictions (27:1). The member jurisdictions of IRP are all states except Alaska and Hawaii and the District of Columbia (27:1). Basically the commercial carrier registers with their home or base state in which they are located or with which they travel the most yearly miles. The base state is then responsible for collecting information from the carrier explaining how the percentage of the carrier's yearly miles are divided amongst the rest of the apportioned states. The fees collected are then distributed amongst the participating states according to the percentage of the miles traveled by the carrier.

HM-223 - A Departure From Established Legislation

Not all current regulation is aimed at reducing state's rights with respect to hazardous materials transportation. HM-223 was created in an environment of controversy within the hazardous materials community. Following the events of September 11, 2001, new federal legislation was enacted that seemed to fly in the face of long-established regulations promoted by DOT itself at the federal level (28:2). While most of the new definitions established by the DOT only apply to rail, many of those within the hazmat industry feel this legislation opens the floodgates to changes for other modes as well.

> The Hazardous Materials Transportation Act (HMTA), as amended and recodified and the Hazardous Materials Regulations (HMR) issued there under, have long recognized that the movement of hazardous materials, including loading, unloading, and storage incidental to the movement, is

> solely the purview of the federal government. In enacting the HMTA, Congress noted that the uniform federal regulation of hazardous materials transportation is essential to the safe and efficient movement of those products, and essential to the national economy. This uniform federal regulation is so vital to the free flow of commerce that Congress has specifically preempted any state or local regulation that is inconsistent with or goes beyond the federal regulations.
>
> Historically, the Department of Transportation has regulated the loading, unloading and temporary storage of rail tank cars containing hazardous materials. These regulations have provided a uniform set of minimum requirements for tank car unloading and storage.
>
> In its first Final Rule on HM-223, published in the *Federal Register* on October 30, 2003, the Department of Transportation (DOT) redefined transportation to exclude tank car loading, unloading, and temporary storage. This redefinition presents an opportunity for state and local officials to begin to issue regulations of the type that have previously been preempted. For example, local regulators have prohibited more than one rail car at any specific location, they have required that tank cars be unloaded within 24 hours of arrival, and they have required that anyone seeking to unload tank cars be issued a permit by the governmental entity, and demanded onerous conditions be met before any such permit is issued.
>
> While onerous local regulation is one consequence of the final rule, the total absence of safety regulations in certain, perhaps most, jurisdictions is another. As noted by the National Transportation Safety Board, neither OSHA, state OSHA agencies, nor the EPA has any regulations whatever covering tank car loading, unloading, or storage (29:1).

Prior to HM-223, the federal government controlled the regulations surrounding hazardous materials transportation and justified this by acknowledging that relatively free movement of these materials was of vital economic importance. Uniform regulations across state and local borders was essential to keeping the efficient flow of commerce and thus federal regulations always preempted any incongruent state or local regulations. The first final ruling of HM-223 effectively excluded several rail transportation activities previously covered by federal authority thus exposing and possibly subjecting these key activities to state and local regulation.

A watershed event has already occurred following this legislation and has placed hazardous materials regulation into disarray following several appeals which eventually led to an overturned ruling. D.C. Bill 16-77 was passed by the D.C. City Council on February 1, 2005 and signed into law on February 15, 2005 by Washington, D.C. Mayor Anthony Williams. It effectively prevented rail and truck transportation companies from transporting certain hazardous materials through the District of Columbia. CSX railroad immediately filed a suit against Washington DC citing, "The D.C. measure violates the Commerce Clause of the U.S. Constitution, as well as express preemptive provisions of the Federal Railroad Safety Act, the federal Hazardous Materials Transportation Act and the Interstate Commerce Commission Termination Act" (30:1). Initially an appeal to temporarily block the injunction was denied and thus CSX was forced to temporarily re-route around the Washington D.C area. The ruling was eventually overturned in late April 2005 by the U.S. Court of Appeals for the District of Columbia Circuit and represented a major victory for CSX and other hazardous material transporters as other communities such as Baltimore, Maryland and Cleveland, Ohio (31:23) are also discussing similar legislation.

Current Federal Direction

Given the lack of academic research in the area of hazmat transportation regulation, this research relies primarily upon government publications as a source of study on the impacts of federal legislation on the states and the trucking industry. The Federal Motor Carrier Safety Administration (FMCSA) hired Battelle, a private consulting and research firm, to conduct a State Hazardous Materials Compliance Effectiveness Study in 2002 (32:1). Its primary objective was to review each state's

practice for its hazardous materials (HM) transportation compliance programs and to identify exemplary initiatives and programs that could serve as a model for other states to consider. The report recognized, "Most states have similar overall programs for regulating hazmat transportation in order to be consistent with Federal requirements and as part of the Motor Carrier Safety Assistance Program (MCSAP) grant program. However, not all states are the same in the manner in which they implement their programs and some state processes are more effective than others. Some states may have a different perspective and a unique way of achieving their program goals. The purpose of this project was to look across all state programs and identify highly effective or exemplary programs, as appropriate" (32:2). The study specifically looked at the states' FY 01 Commercial Vehicle Safety Plans (CVSPs) to devise a questionnaire aimed at updating, confirming and documenting each state's authority and ability to conduct hazmat enforcement beyond roadside inspections and audits. The study found that a review of the CVSPs revealed that few states (12 states) even included hazardous materials compliance and enforcement in their safety plans and of those twelve states very little additional information was given (32:2). After several reviews and questionnaires of each state's hazardous materials compliance offices, eight states were identified for further study and to capture benchmarks for other states to follow in establishing their own programs. These states included Ohio, Missouri, New York, California, Colorado, Illinois, South Carolina, Kentucky, Minnesota, Rhode Island, Texas, and West Virginia. With the help of the state contact point for each state, a series of interviews was scheduled with key staff from each of the seven program areas of interest: roadside inspections; compliance reviews; shipper reviews; education, training,

and outreach; hazmat security; permitting, registration, and routing; and cargo tank inspection and testing. Finally a matrix of key compliance measures was constructed using various data points collected to arrive at a Compliance Measurement Index (CMI). The CMI was based on a 0-25 point value scale with 25 being the most compliant. States ranged from a CMI high of 17 (Ohio) to 0 (District of Columbia). Most states were lacking several data points for accurate CMI compilation due to non-existent documentation, lack of cooperation or inability at the state level to adequately track the seven metrics described above. This effectiveness study underscored the difficulty in obtaining useful hazmat regulation data at the state level (32:2).

The FMCSA did not just publish the State Hazardous Materials Compliance Effectiveness Study and shelve it. In January, 2004, the FMCSA followed up with a Guide for Building a Model State Hazardous Materials Program based upon the conclusion and recommendations of the study conducted by Battelle. The guidebook contains seven sections directly aimed at state uniformity and federal compliance with hazardous materials regulations. The seven sections of the guidebook are as follows:

Section 1: Facility Compliance Reviews
Section 2: Roadside Inspections
Section 3: Regulatory Training & Outreach
Section 4: Permitting, Registration & Routing
Section 5: Regulatory Authority & Enforcement
Section 6: Other Program Initiatives
Section 7: Program Resources

This guidebook is the Secretary of Transportation's answer to Section 5119 of the Federal Safety Reauthorization Act (current regulation) and provides states with the framework to construct their own hazmat transportation program within their borders.

Summary

The review of the literature as it pertains to hazardous materials and transportation regulation has covered an overview of hazardous materials definitions and class documentation, a side-by-side comparison of recent hazmat regulations at the federal level, a more in-depth review of a few key changes to the hazardous materials regulations, and an exploration of the current topics and studies conducted on hazardous materials transportation research. The review has yielded some unexpected information particularly in the lack of parity between states when administering hazmat security and compliance programs. Additionally, it points to a need for further research and study on hazmat policy and regulation at the state level. This research aims to expand upon the existing knowledge in this area.

III. Methodology

Overview

This chapter addresses the methodology used for this research. Since current research on hazardous materials regulation in the trucking industry is limited and understanding of this research topic can only be ascertained by gleaning information from several sources of information, this thesis will employ a meta-analysis research method to determine answers to the proposed research questions outlined in chapter one. A meta-analysis combines the results of several studies that address a set of related research hypotheses. Put in another way, meta-analysis is the synthesis of available literature of a topic. Meta-analysis is widely used in the medical field to diagnose illness based on the accumulated knowledge and literature within the medical community. This thesis employs a meta-analysis methodology in much the same manner in answering the six research questions to better gain an insight into relationships surrounding hazardous materials regulation between states and the trucking industry.

Research Objective

The primary objective of this research is to gain a better insight into hazardous materials regulations and their impact at the state level with respect to the trucking industry. With all of the levels of regulation currently in place associated with hazardous materials transport, it is increasingly difficult for transporters and shippers to remain informed and current on the latest state requirements. Interstate transport of these materials is further compounded by the fact that each state requires its own unique set of regulations, fees, permits, routing and special requirements. A study of this field of

transportation is necessary to collect and identify aspects of training, licensure, routing, and regulation to pinpoint differences, constraints and best practices. Therefore, the overall research question is, "Are state hazmat regulations becoming more restrictive and would an in-depth analysis of these regulations aid in the understanding and compliance of the complex set of rules currently in place for this industry?".

Six investigative questions are used to address this research problem:

1. How have the regulations evolved with the deregulation of the trucking industry?

2. How have the events of September 11th, 2001 changed the way hazardous materials are routed or regulated at the state level?

3. What states have unique or unusually restrictive hazardous materials transportation regulations?

4. What patterns of similarity or incongruent regulations exits amongst states (are there any apparent barriers to entry between bordering states or across regions)?

5. Are the states streamlining the certification processes and regulations amongst themselves or are the rules and regulations becoming more and more complex as new federal regulation is introduced and therefore creating more of a disparity among states?

6. Do any national or regional corridors exit for transporting hazardous materials (preferred routes or obvious corridors established by compatible regulations between counties or states)?

Method

While a meta-analysis methodology has mainly been employed throughout the medical community, there are several studies and research initiatives utilizing this type of analysis in the transportation research arena. In 2003, the Colorado Department of Public Health and Environment conducted a diesel exhaust emissions study analyzing 23 diesel exhaust human exposure cases (32:7). The National Highway Traffic Safety Administration also commissioned a meta-analysis of screening and intervention of alcohol related treatments in emergency rooms aimed at identifying and possibly reducing the number of intoxicated drivers (34:1).

Metadata is another term often associated with meta-analysis and is commonly defined as "data about data". More broadly defined, metadata is descriptive information about any object or resource, as diverse as geospatial and non-geospatial datasets, data analysis tools, computer models, websites, graphics and textual information (35:1). Metadata is essential to this research as it forms the foundation for many of the maps and other graphical interpretations of the findings of this thesis.

Generally, a meta-analysis begins with four basic steps depending upon the level of detail sought or the type of research conducted (36:2):

1. Develop a research question(s) and identify studies or sources of interest
2. Select the most pertinent sources
3. Decide between a fixed effects model or a random effects model
4. Calculate a summary effect and interpret the results

This thesis utilizes the data collecting strategies outlined by a meta-analysis research method but stops short of conducting quantitative hypothesis testing outlined in

step three due to the qualitative nature of the data collected. The meta-analysis procedures employed by this thesis provide an excellent framework for more in-depth research and the exploration of alternative methodologies by compiling available data into a central location. Although this research mainly employs a meta-analysis methodology, several aspects of case studies and interviews also contribute to the knowledge gained in this research.

Some concepts pertaining to case studies and interviews prescribed by Robert Yin are also discussed and applied to the methodology. Yin describes a case study as an empirical study that investigates a contemporary phenomenon within its real-life context, when the boundaries may not be clearly evident (37:13). This research embodies the definition of Yin's interpretation of a case study within the hazardous transportation regulation realm and grapples with the immediate reality of few current sources from which to draw conclusions. Therefore, it should be noted that only one complete case study, the State Hazardous Materials Compliance Effectiveness Study, is used for the purposes of analysis for this research, and the results of this study are combined and compared to data from other DOT and state sources and primary data collected by the researcher.

Yin also addresses the "how" type research questions in the following manner; he suggests that case studies, histories, and experiments are the preferred research methods (37:6). Investigative questions one and two are two such questions. Each question is answered by comparing available historical data and current regulations to suggest trends and interpretation. In addition, interviews with several state officials were conducted specifically addressing these particular investigative questions. While these data

collection methods are by no means comprehensive, they do provide essential knowledge in this field of research that was previously unknown.

Investigative questions three and five are qualitative in nature and are largely based upon the interpretation of available data specifically from J.J. Keller and Associates, the Alliance for Uniform Hazmat Transportation Procedures, the investigation of HM-223 and its possible implications for states' future legislation, and from the telephone interviews conducted of state officials. However, a quantitative aspect of investigative question three is answered by comparing the number of interpretations or additions to the federal hazmat regulations by state and performing a rudimentary analysis of such data.

Patterns, barriers to entry, and national corridors for hazardous materials transportation are examined in investigative questions four and six largely through the use of maps and other graphical methods designed to portray visual images of the landscape of hazmat transportation and regulation as it currently exists in databases, case studies, and other non-graphical representations. From the display of these maps, it is expected that this research technique will yield useful and insightful data analysis not easily achieved through alternate means.

Data Sources

Much of the data collected for the purposes of this research can be categorized into two types: metadata and qualitative data. Many of the sources of data gathered for the analysis of this research are from the Department of Transportation. However, the data provided to the DOT comes from several different sources. The vast majority of the

metadata collected is in the form of large databases containing information about state hazmat registration data provided by the DOT from FY 01 through FY 05 (38:1).

Complementing this metadata is another set of databases provided by the DOT detailing hazmat incident reports by state to include carrier information, type of accident, type of hazardous material involved, and actions taken (38:1). The DOT has databases containing hazmat incidents dating back to 1993 but for the purposes of this research, data from FY 01 through FY 05 will be utilized. The data contained in these databases represents over 200,000 data points capturing information about hazardous materials registration broken down by state, business size, type of business, and contact information.

An additional source of metadata is from the State Compliance Effectiveness Study conducted by Battelle on behalf of the DOT in 2002. The State Compliance Effectiveness Study provides this research with a case-study and benchmark model for future research. Several charts and maps are derived from the data contained within the compliance effectiveness study to show various patterns of compliance amongst states in regard to federal regulations. Another significant source of information for this research came from J.J. Keller and Associates Incorporation, a private company specializing in the publication and distribution of hazardous material training and regulation handbooks. The spreadsheet matrix product utilizes qualitative data from their publications and demonstrates the effectiveness of compiling data into one central location. Qualitative data is also obtained through interpretation of case study findings and by telephone interviews with state hazmat officials from several states.

Data Collection

Data collection for this research is based upon five types of collection sources as shown in Figure 16.

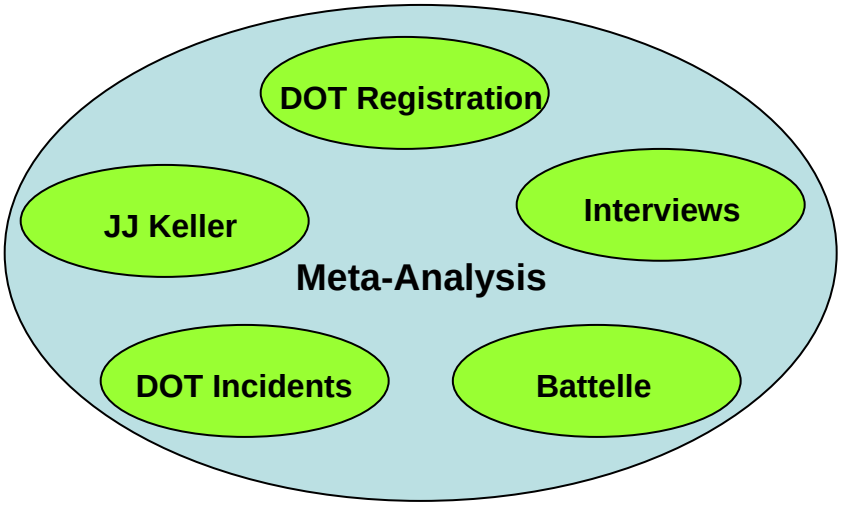

Figure 16. Sources of Meta-analysis

Metadata

Analysis of metadata is also sometimes referred to as archival data analysis. As previously mentioned, the vast majority of metadata is Hazardous Materials Registration Data in the form of database files: {regis01dbase.exe (2001-02), regis02dbase.exe (2002-03), regis03dbase.exe (2003-04), regis04dbase.exe (2004-05), and regis05dbase.exe (2005-06)} complemented by Hazmat Incident reporting databases: {2001mat.exe, 2002mat.exe, 2003mat.exe, 2004mat.exe, and 2005rep.exe}. Metadata is also found in Battelle's State Compliance Effectiveness Study in the form of several charts and tables which are used to extrapolate hypotheses relevant to this thesis and to graphically

represent patterns of compliance or inequity amongst the states' hazardous materials programs.

Case Study

The State Compliance Effectiveness Study serves as the basis for much of this research. This compliance effectiveness study provided the Secretary of Transportation the means in which to issue a Guide for Building a Model State Hazardous Materials Program. Qualitative data contained within the study is used to answer parts of investigative questions three, four, and five and to identify states in which to further investigate via telephone interviews.

Telephone Interviews

States were selected for telephone interviews based upon recommendations from the compliance effectiveness study, from knowledge gained through data collection, and contact availability. The states included for telephone interviews are: Illinois, Michigan, Minnesota, Nevada, Ohio, Oklahoma, and West Virginia. Selection of these states are based upon the fact that four states (Illinois, Minnesota, Ohio, and West Virginia) scored high in the Compliance Effectiveness Study and the rest of the selected states fell out at various levels of compliance. All of the selected states are also members of the Alliance for Uniform Transportation Procedures and represent the full spectrum in terms of size of their federal hazmat registration programs. Several other states were eliminated from contention since they have numerous agencies responsible for different aspects of hazardous materials. For example, Alabama's hazmat overall hazmat registration

program falls under the state's Department of Transportation but enforcement, licensure and special permits are handled by the Highway Patrol, and Public Utility Commission-commercial vehicle offices respectively. The telephone interviews focus on answering parts of each of the investigative questions but are primarily limited in scope to gathering data about selected state's perceptions of their roles in administering hazardous material regulations, their effects on the trucking industry, and trends in changing levels of regulation. The intent of the interviews is to question equivalent hazmat transportation departments within each of the selected states.

Direct Observational Analysis

Much of the research conducted in this thesis is comprised of gleaning portions of existing data and transforming it into useable and meaningful representations that allow for the explanation of the six investigative questions proposed. By graphically representing the data and observations collected in conducting this research, previously undetected patterns and relationships amongst states with respect to their hazardous materials regulations emerged. Observing these relationships and interpreting them is an integral part of the methodology.

Research Design/Validity

The quality of the research is only as good as the design and validity of the testing procedures. While the steps outlined for a basic meta-analysis provide a good overall design, a more robust validity measurement tool is needed to ensure accuracy and clarity of the analysis. Once again, Yin provides a guideline to promote reliability and strength

to the research design used for this research (37:34). Four tactics are shown in Table 1 to ensure a sound research model.

Table 1. Four Tactics for Research Design Tests (Yin, 2003)

Tests	Case Study Tactic	Research Phase in which tactic occurs
Construct validity	Use multiple sources of evidence	Data collection
	Establish chain of evidence	Data collection
	Have key informants review draft case study report	Composition
Internal validity	Do pattern matching	Data analysis
	Do explanation building	Data analysis
	Address rival explanations	Data analysis
	Use logic models	Data analysis
External validity	Use theory in single-case studies	Research design
	Use replication logic in multiple-case studies	Research design
Reliability	Use case study protocol	Data collection
	Develop case study database	Data collection

Construct Validity

Construct validity incorporates choosing a sound methodology for the basis of research, utilizing multiple data sources or sources of evidence, establishing a clearly defined evidence trail, and sharing information and results with reviewers. The DOT

data in this study comes from many different reporting sources (case study, states, and DOT databases) thus adding to the construct validity.

Internal Validity

Theory and pattern matching is an essential part of the internal validity of this research. Pattern matching is divided into theoretical and observational realms which are on opposite ends of the spectrum. Theories propose key relationships or structural patterns of proposed research while observational data shows the reality of the research. Pattern matching is the process by which the researcher links the two realms thus supporting or refuting the initial hypothesis. Explanation building strengthens the pattern matching process and provides a clear and decisive roadmap of the conducted research. If a clear and decisive conclusion cannot be made from pattern matching and explanation building, then alternate conclusions or explanations need to also be addressed. Finally, logic models are a way to address the soundness of the research model by mapping out the basic flow of the research, charting data gathering methodologies, identifying analysis tools and methods, and displaying results. This research makes use of all of the four methods described by Yin for internal validity (37:36).

External Validity

Since this research utilizes very specific hazmat data from the DOT and a limited number of states, the results of this research can only be confidently applied to the narrow scope of this thesis. Additional research is necessary to begin to unravel the complex and intricate web of federal and state legislation regulation as it applies to various aspects of

the broader topic of hazardous materials regulation. However, the method and results of this research can be directly applied to other state-by-state hazmat studies and benchmarking case studies involving state hazmat compliance. Additionally, trends identified in this research may be germane to other states and overall, the analysis and results of this research provide a baseline for future research in state level hazmat policy.

Relaibility

The extent to which much of this research is able to be reproduced with similar results is mainly limited to the graphical representations based upon the metadata and other quantitative data. Telephone interviews and case study analysis are always subject to interpretation but more encompassing future research should increase the reliability of this research by introducing different methodologies, survey data, and additional telephone interviews of various state and federal government officials.

Data Analysis

All metadata collected is filtered to only include pertinent information applicable to this research. The data contained within the DOT files previously mentioned consist of a wealth of information which had to be gleaned to obtain data necessary for this research. Since this research is breaking new ground, the multiple ways of presenting this data provide a baseline for analysis where there is currently a lack of precedents. Quantitative data analysis mainly consists of simple graphical representations often in map or table format and corresponding analysis of what the map or table represents accompany the representation. Qualitative data analysis combines aspects of several data

sources referred to in Figure 16 to determine logical answers to investigative questions and the research objective posed by this thesis. Results of information gathered in the literature review and responses of telephone interviews are included where applicable, and are included in the analysis of the investigative questions to answer the overall research question.

Summary

This chapter outlines the methodologies used in this thesis to construct a sound and valid research model. Both meta-analysis and case study methods described by Yin are used based upon the type of data collected and direction of the research. Meta-analysis provides the foundation for data gathering and data centralization as well as the means in which to organize sources and metadata while Yin's case study tactics provide the validity and reliability necessary for sound research. Specifically, these techniques provide insight to answer the overall research question.

IV. Results and Analysis

Overview

The results, findings, and analysis of this research are presented in this chapter and are derived from many different sources previously described in the meta-analysis methodology. Primarily, the literature review, interviews, and archival data provide the basis for this research and are guided by the focus of the six investigative questions. Results and analysis are largely based upon an investigation of available meta-data and invaluable information uncovered through interviews with state officials.

The literature review focused on the changing environment of federal hazmat regulations over the past decade with special attention given to specific aspects of the legislation that have impacted state's rights when administering their respective hazardous transportation programs. Next, seven interviews conducted of state officials from Illinois, Michigan, Minnesota, Nevada, Ohio, Oklahoma, and West Virginia provided this research with an abundance of unique perspectives, previously undocumented data, and new insights into how states perceive their roles have changed as Federal legislation has evolved. Finally, archival or meta-data in the form of five databases pertaining to Federal hazmat registration from 2001 through 2005 containing 203,715 data points and five databases pertaining to hazmat incidents by state during the same period containing 80,773 data points were used to analyze specific patterns and to portray graphically the landscape of hazardous transportation as seen at the state level.

Investigative Question One

How have hazardous materials regulations evolved with the deregulation of the trucking industry?

The Motor Carrier Act of 1980 effectively deregulated the trucking industry and along with it, the hazardous transportation subset of the trucking industry was also liberated from excessive constraints. This research did not uncover any substantial events pertaining to hazardous materials transportation immediately following the deregulation and in fact uncovered a document, the 1986 Handbook for State and Local Hazmat Transportation Activities that reiterated this fact (39:3). Much of the changes to hazmat legislation at the state and Federal levels began after 1990. Congress realized that after ten years of free reign, the trucking industry had flourished and grown beyond most state's ability to efficiently manage the licensure, registration, and legislation of their hazmat programs without impeding this vital economic activity. Congress threatened to implement sweeping changes to the existing state programs and replace them with a federally mandated standardized hazmat program designed to streamline operations for the hazmat transportation industry. After nearly four years of debate, the states proposed a compromise in which they would retain the right to implement their own hazmat programs but they must form an alliance to institute standard forms, procedures, practices, fees, and other activities aimed at improving efficiencies amongst states. Meanwhile, Congress instructed the DOT to start working on studies focusing on providing guidelines for routing of both hazardous and radioactive materials and measuring the compliance effectiveness of each of the state's hazmat programs.

The rate of change to the legislation of HMRs has steadily increased in frequency since the late 1990s with new Federal Safety Reauthorization Acts now being issued approximately every two years. The subject of Federal pre-emption has long been an issue amongst states but until fairly recently, states could either choose to adopt the Federal standards as their own or enact more stringent layers of legislation within their borders. It should be noted that as the rate of HMR legislation increased, the rights of the individual states decreased with each successive Safety Act. The Federal Safety Reauthorization Act of 2001 was especially pivotal as states no longer have the right to issue hazmat legislation more excessive than Federal standards and are now forced to abide by guidelines set fourth by the Secretary of Transportation regarding cooperation in uniform hazmat registration programs.

Five of the seven state officials interviewed felt that the current trend of more federally mandated hazmat program legislation would continue. One interviewed official surmised that the future of hazmat legislation at the Federal level would ultimately require all states to register all types of hazardous material regardless of type. Another interesting trend these interviews uncovered was the paucity of current hazmat legislation being proposed at the state level. Most of the state officials interviewed said the Federal guidelines made any state legislation redundant and therefore unnecessary as long as they followed the established regulations. It is clear that given the relatively short history of increased Federal involvement regarding hazmat legislation and regulation, this is an area of study that needs to be continuously monitored and updated in order to gain a more precise picture of the issues surrounding hazardous materials transportation.

Investigative Question Two

How have the events of September 11th, 2001 changed the way hazardous materials are routed or regulated at the state level?

The aftermath of 9/11 created the Department of Homeland Security and brought some aspects of hazardous material registration and legislation under the umbrella of Homeland Security through the Patriot Act of 2001. Perhaps the biggest impact to the hazmat industry in regards to changes in hazmat regulation following 9/11 has been in the driver registration requirements. Several background checks are now mandatory for any commercial (private or for-hire) driver transporting hazardous material and some crimes can permanently or temporarily exclude drivers from obtaining a hazmat endorsement. The pool of available hazmat qualified drivers is considerably impacted by these new regulations but since the rules went into effect in January 2005, not enough time has elapsed to fully investigate the actual damage to the trucking industry in terms of lost productivity, increased rates for hazardous materials transportation, and other economic impacts. The state-run commercial hazmat drivers programs are only required to abide by the Federal guidelines to qualify as an approved program. Unlike the federally mandated hazmat legislation, there seems to be no trend in either unifying the way states carry out their commercial hazmat drivers programs or requiring a Federal program to do so.

An investigation into the changes to state legislation and routing post September 11th produced surprising results. Of the seven states contacted via interviews, six state officials said no routing changes have occurred as a direct result of the events of 9/11. Only Nevada imposed a restriction on hazmat shipments traveling across the Hoover

Dam. When asked about similar national landmarks and sensitive routes such as bridges and through major cities, all state officials reported that routing around these areas was already in place before September 11, 2001 and existing routes post 9/11 were bolstered by increased security measures and roadside inspections. New legislation at the state level has been impacted by Federal regulations that effectively render any new state initiatives obsolete in the opinions of the seven state officials interviewed. With the exception of some minor legislative changes amongst Alliance states to mirror their respective programs with the Federal regulations, no new legislation has been proposed or implemented as a result of September 11th, 2001.

Investigative Question Three

What states have unique or unusually restrictive hazardous materials transportation regulations?

This investigative question was formed around the perception that states differed widely in respect to their individual state hazardous materials programs. While this may have been the case in the years immediately following the de-regulation of the trucking industry, it is no longer true following the past decade of Federal legislation aimed directly at standardizing the myriad of state regulations that threatened to hamper efficient commerce of the hazardous transportation industry. A review of the 1986 handbook entitled *Transportation of Hazardous Materials: State and Local Activities* revealed, "The states mirror Federal functions and responsibilities to a degree, but the structure is by no means uniform or even comparable from state to state" (39:14). Furthermore, the handbook stated that some states had extensive hazmat programs in

place in which coordination between regulation, enforcement, emergency, and training agencies were closely linked while others were still in the formative stage (39:14). In addition, the handbook pointed out that great variation between states in respect to laws and exemptions make it burdensome for interstate carriers (39:28). For example, some states exempt specific agricultural commodities while others exempt private carriers from Federal regulation (39:28). Illinois' hazmat regulations only apply to quantities requiring placarding by Federal law and South Dakota exempts shipments of flammable and combustible liquids from state hazmat legislation. On the opposite end of the spectrum are states such as Massachusetts, Utah, Washington, Idaho, and Oregon which utilize State Hazardous Materials Enforcement Development (SHMED) computer programs to link and monitor incident and enforcement databases to evaluate how effective their respective state hazmat programs are in carrying out regulation (39:28).

Twenty years ago, states had much more autonomy over their individual hazardous materials programs and related legislation even though the Federal regulations were starting to encourage uniformity and compliance of states with incentives such as the Motor Carrier Safety Assistance Program (MCSAP). The MCSAP grant program was designed to improve state capabilities, to enforce Federal Motor Carrier safety regulations, and to enable states to increase safety inspections of intra and interstate commercial vehicles (39:19). Today those early initiatives have created a more level playing field in terms of hazmat regulations across states and this trend seems to be continuing. Table 2 shows the status (as of Jan 03) of state hazmat programs broken down by hazardous materials, hazardous waste, and radioactive materials (40:1).

Table 2. State Permits and Registration (NCSL, 2003)

	All Hazardous Materials (HM)		Hazardous Waste		Radioactive Materials	
Updated 01/2003	Registration	Permitting	Registration	Permitting	Registration	Permitting
Alabama				X		
Alaska						
Arizona			X			
Arkansas				X		
California		X		Incl. in HM		Incl. in HM
Colorado		X		Incl. in HM		X
Connecticut				X		X
Delaware				X		
Dst. of Columbia		Explosives				
Florida				X		LLW only
Georgia		PCB/LNG				X
Hawaii		Explosives				
Idaho	Endorsement			X	Incl. in HM	
Illinois			AUHTP	AUHTP	Spent fuel fee	LLW only
Indiana					Spent fuel fee	
Iowa						
Kansas			X			
Kentucky			X			
Louisiana		LPG/ammonia				
Maine		Oil by rail	Fee only			Turnpike
Maryland				X		HLW in tunnels, LLW
Massachusetts				X		
Michigan		Explosives	AUHTP	AUHTP		LLW only
Minnesota	AUHTP	AUHTP	AUHTP	AUHTP Part III	AUHTP	AUHTP Spent fuel fee
Mississippi						X
Missouri				X		
Montana						

	All Hazardous Materials (HM)		Hazardous Waste		Radioactive Materials	
Nebraska						
Nevada	AUHTP	AUHTP	AUHTP	AUHTP	AUHTP	AUHTP Pt. III
New Hampshire		X	X			HLW only
New Jersey				X		X
New Mexico		X		Incl. In HM		Incl. In HM
New York				X		LLW only
North Carolina						
North Dakota						
Ohio	AUHTP	AUHTP	AUHTP	AUHTP Part III	AUHTP	AUHTP
Oklahoma		LPG	AUHTP	AUHTP		
Oregon						X
Pennsylvania				X	Spent fuel escort and fee	Turnpike
Rhode Island				X		X
South Carolina				X		X
South Dakota						
Tennessee			X		Spent fuel fee	LLW only
Texas		LPG				
Utah						HLW only

Vermont	For non-IRP			X (per truck)	Spent fuel fee	
Virginia				X		
Washington						
West Virginia	AUHTP	AUHTP	AUHTP	AUHTP	AUHTP	AUHTP
Wisconsin				X		
Wyoming						X
TOTALS	6	16	13	27	10	25

AUHTP=Alliance for Uniform Hazmat Transportation Procedures

LLW=Low-level radioactive waste, HLW=High-level radioactive waste, LPG=Liquified petroleum gas *Source: NCSL,Jim Reed, jim.reed@ncsl.org*

States have the right to enforce and manage their hazmat programs through permits and registration so long as their programs adhere to or are less stringent than the Federal regulations. States break down hazardous materials into three main subsets. The largest is the general hazardous materials class, next is the hazardous waste subset, and finally radioactive materials comprise the triad of hazmat materials. Most states rely on the Federal hazmat regulation program as the basis for hazardous materials registration while sixteen states require an additional permit to transport hazardous materials within their borders. Hazardous waste is more closely monitored than hazardous materials and therefore thirteen states employ a registration program at the state level while over half of the states in the union require a permit to transport hazardous waste. A surprising finding of this research was the fact that only 10 states require transporters of radioactive materials to register at the state level and half of the states require a permit. The Federal guidelines regarding radioactive materials are fairly rigid and have been in place for many years and have been further bolstered by provisions within the Patriot Act which may partly explain this phenomenon at the state level. Since the Federal regulations

supersede state registration and permit programs, this research has led to the conclusion that no state is effectively more or less restrictive in its approach to regulating hazmat within its borders. Differences between states occur due to the types of registration, permits, organizational structure, and resources states put into place to manage their overall hazmat programs. Investigative question four expounds upon another aspect of the differences between states and further clarifies the distinction amongst state differences regarding hazmat programs.

Investigative Question Four

What patterns of similarity or incongruent regulations exist amongst states (are there any apparent barriers to entry between bordering states or across regions)?

Of the seven states interviewed for the purpose of this research, not one of the state officials recognized border crossing barriers between states as a problem either for the hazardous materials transportation industry or for the states administering their respective programs. However, incongruent regulations in the form of registrations and permits do exist and transporters of hazardous materials must be cognizant of these differences in registration and permit requirements when engaging in interstate transportation. Figure 17 depicts the landscape of state registration and permits graphically and shows these patterns at the state level.

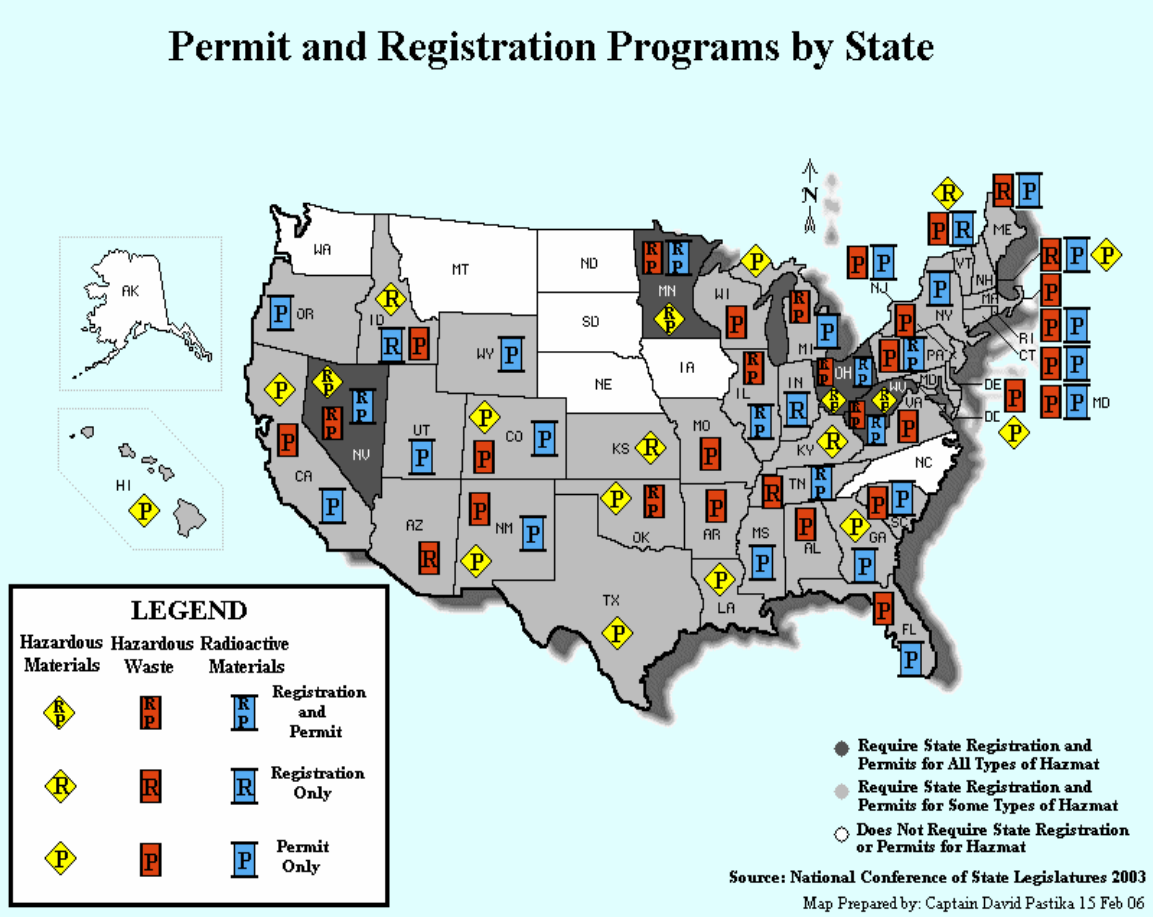

Figure 17. Permit and Registration Programs by State

It is interesting to note that the four states depicted in black (Minnesota, Nevada, Ohio, and West Virginia) are all members of the Alliance for Uniform Transportation Procedures yet these states appear to be the most regulated in terms of registration and permits required for the transport of hazardous and radioactive materials through their states. Information regarding the process (i.e. registration, permits, and regulations) shippers and carriers must go through for each state they conduct business with is not easily accessible and readily available in the public domain. Each state with the exception of the Alliance states needs to be contacted individually to ascertain the details of their permit and registration programs or shippers and carriers must rely on third party

companies like J.J Keller and Associates which provide hazmat regulation, registration, training, and permit guides to the industry.

Another aspect that adds an additional layer of complexity to state hazmat programs in terms of regulation is organization. Organizationally, states run the gamut from enforcement to fee collecting agencies that are anything but consistent from state to state. Just comparing the enforcement agencies that have authority over carriers and shippers we see that states have employed police (state and highway patrol), state DOTs, Department of Motor Vehicles, Environmental Offices, Public Utility or Public Service Commissions, and other miscellaneous entities to govern hazmat activities at the state level. Table 3 shows individual states and the enforcement agencies that manage their respective hazmat programs. A quick scan reveals several states with multiple agencies with authority over hazmat carriers and shippers: Florida, Minnesota, Ohio, Pennsylvania, Texas, West Virginia, and Wyoming employ four or more enforcement agencies in dealing with hazardous materials transportation. Again, it is interesting to note that three of these states are also Alliance members and are actively trying to streamline the process for managing hazmat.

Table 3. State Agencies With Authority Over Hazmat Carriers & Shippers (Battelle, 2003)

State	State Police	DOT	DMV	ENVR	PUC/PSC	Other	Total with Authority	
							Carriers	Shippers
Alabama	C, S				C		2	1
Arizona	C					C	2	0
Arkansas	C						1	0
California	C,S			C,S		C,S	3	3
Colorado	C,S				C,S	C,S	3	3
Connecticut	C,S		C				2	1
Delaware	C,S			C,S			2	2
Florida	C	C,S		C,S		C,S	4	3
Georgia			C,S	S		C,S	2	3
Hawaii		C,S				C,S	2	2
Idaho	C,S	C,S		C,S			3	3
Illinois	C,S	C,S					2	2
Indiana	C,S						1	1
Iowa		C,S					1	1
Kansas	C			C,S	C,S	C	4	2
Kentucky		C					1	0
Louisiana	C,S						1	1
Maine	C,S						1	1
Maryland	C,S			C,S		S	2	3
Massachusetts	C,S			C,S			2	2
Michigan	C,S			C			2	1
Minnesota	C,S	C,S		C,S		C,S	4	4
Mississippi					C,S		1	1
Missouri	C			C,S		C,S	3	2
Montana	C	C					2	0
Nebraska	C						1	0
New Hampshire	C,S		C,S				2	2
New Jersey	C,S			C,S		C	3	2
New Mexico	C	C,S					2	1
New York	C,S	C,S		C,S			3	3
North Carolina			C,S				1	1
North Dakota	C					C	2	0
Ohio	C			C,S	C,S	C,S	4	3
Oklahoma	C,S				C		2	1
Oregon	C	C				C,S	3	1
Pennsylvania	C	C	C	C,S	C		5	1
Rhode Island	C,S			C,S	S		2	3
South Carolina	C,S						1	1
South Dakota	C,S						1	1
Tennessee	C						1	0
Texas	C,S	S		C,S	C,S		3	4
Vermont	C		C				2	0
Virginia	C			C			2	0
Washington	C,S			C	C		3	1
West Virginia	C	C	C	C,S	C	S	5	2
Wisconsin	C			C,S			2	1
Wyoming	C,S	C		S	S		2	3

Investigative Question Five

Are the states streamlining the certification processes and regulations amongst themselves or are the rules and regulations becoming more complex as new federal regulation is introduced and therefore creating more disparity amongst states?

Initiatives like the Alliance for Uniform Transportation Procedures are streamlining certain aspects of the state level hazmat procedures but only a handful of states have joined forces and implemented a network of more efficient hazmat processes. Appendix C expounds upon interviews made to seven Alliance member states and lists the details of conversations with state officials. Each representative explained how the Alliance works together to create synergistic efficiencies amongst states that have very different hazmat programs by incorporating simple standardization tools like forms, online registration, and applications. A majority of the states are not members of the Alliance and have created a patchwork of procedures, organizational structures, and hazmat legislation that falls somewhere between completely adopting Federal hazmat regulations and creating their own less stringent state-level hazmat procedures in addition to the Federal regulations. The history of Federal regulation, especially regulation over the past ten years, has led to the creation of this patchwork of inconsistency amongst states due to the fact that every time the Federal regulations change, states must also ratify their own hazmat programs to either mirror the new changes or adopt less stringent state rules. Depending on the state, changes to hazmat legislation may take several years to reflect updated rules. Based on the information gathered during this research, the trend of inconsistency of state hazmat regulations seems to be destined to continue until the DOT and Congress make steps to force states to join the Alliance or completely abolish

the state run hazmat programs altogether and replacing the patchwork of state regulations with a unified Federal program.

Investigative Question Six

Do any national or regional corridors exist for transporting hazardous materials (preferred routes or obvious corridors established by compatible regulations between counties or states)?

In order to answer this investigative question, an amalgamation of data from many sources must first be analyzed and put into a graphical medium that makes sense of the output data. The following set of maps attempt to portray the reality of where the largest hazmat programs are located, where the most highway hazmat incidents occur, and display where the largest concentrations of hazmat traffic are located when factoring out the size of the state's Federal hazmat registration pool. The DOT keeps detailed records of hazmat incidents by state, county, and city. For the purposes of this research, only the state level data was utilized in creating the generalizations displayed on the maps featured in Figures 18, 19, and 20 and 21. Tables 8, 9, and 10 in Appendix C display the data used in producing these maps.

The method described above was selected since there is an absence of primary data that depicts where carriers are transporting hazmat materials around the country. While this method is an indirect measure of describing where hazmat corridors exist, it clearly demonstrates the existence of transportation patterns utilizing the data available to this research. Figure 18 shows the average number of carriers that federally registered in each state from 2001 through 2005. Four bin sizes of approximately equal size were

created and states were categorized accordingly. Each map utilizes the same legend or key when describing states according to categories to ensure the data depicted is standardized for every cartogram. Figure 19 shows the average number of highway hazmat incidents from 2001-2005 for each state and ranks them according to the appropriate rank as previously described.

Figure 18. Federal Hazmat Registration by State 2001-2005

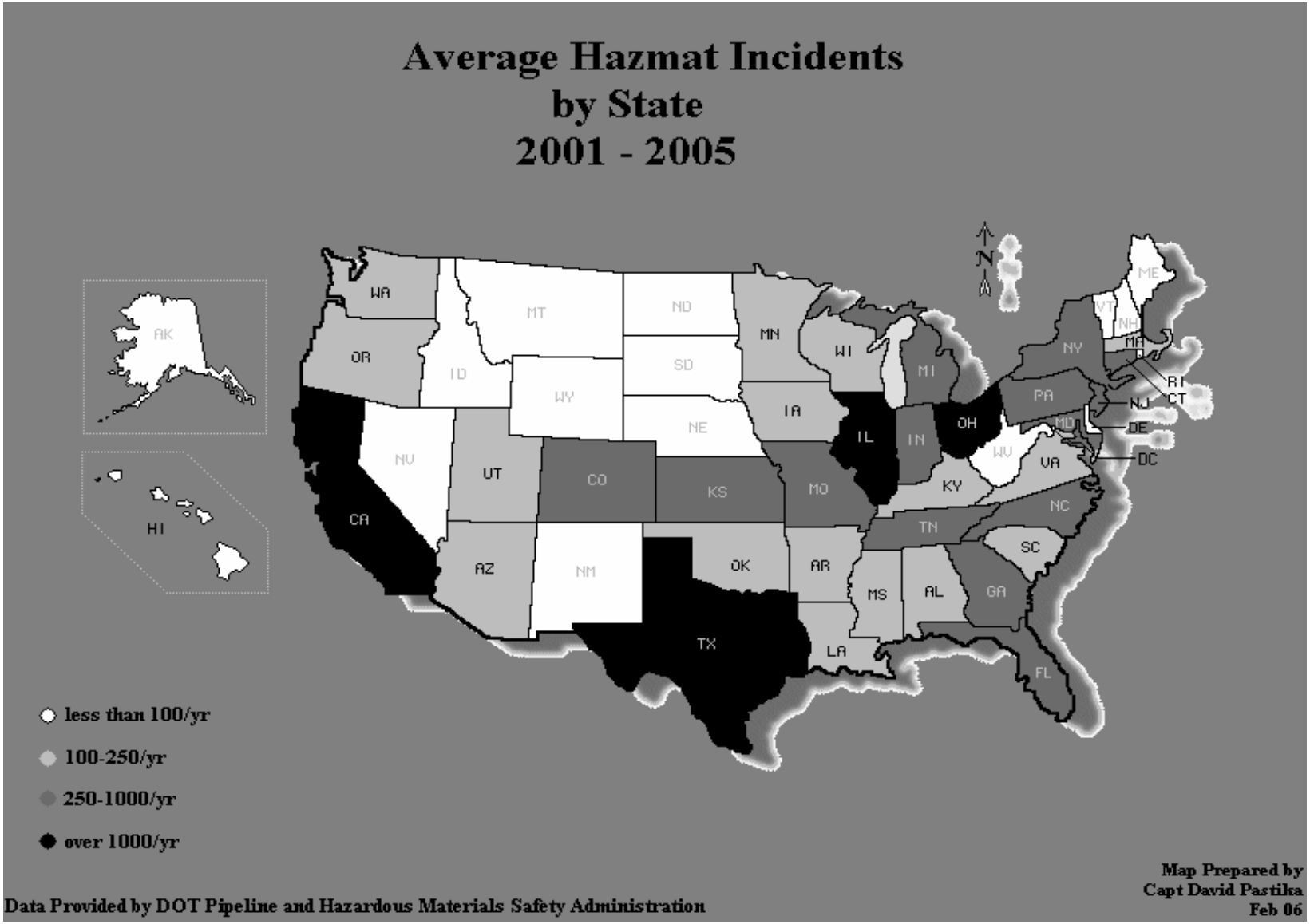

Figure 19. Hazmat Incidents by State 2001-2005

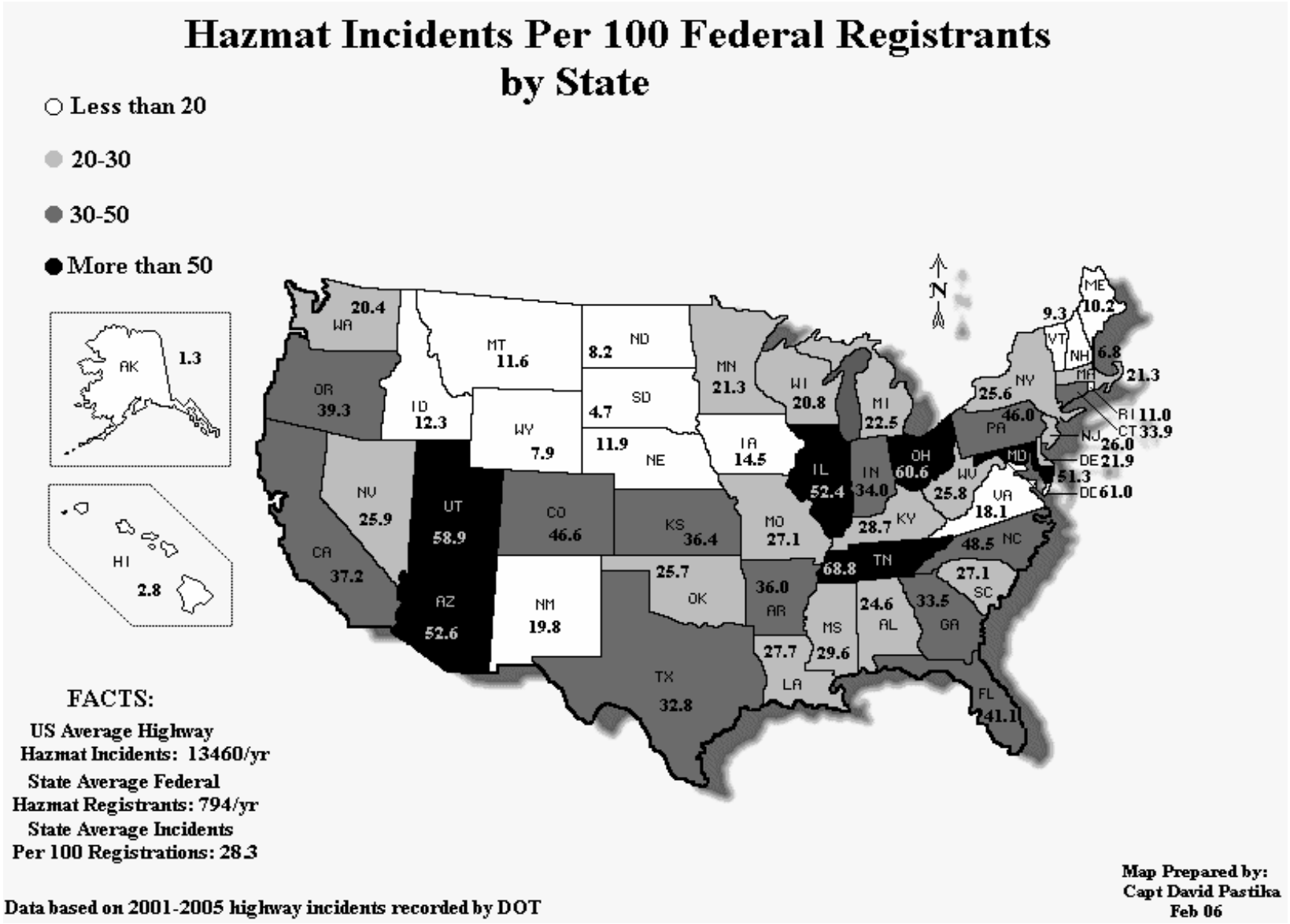

Figure 20. Hazmat Incidents Per 100 Federal Registrations

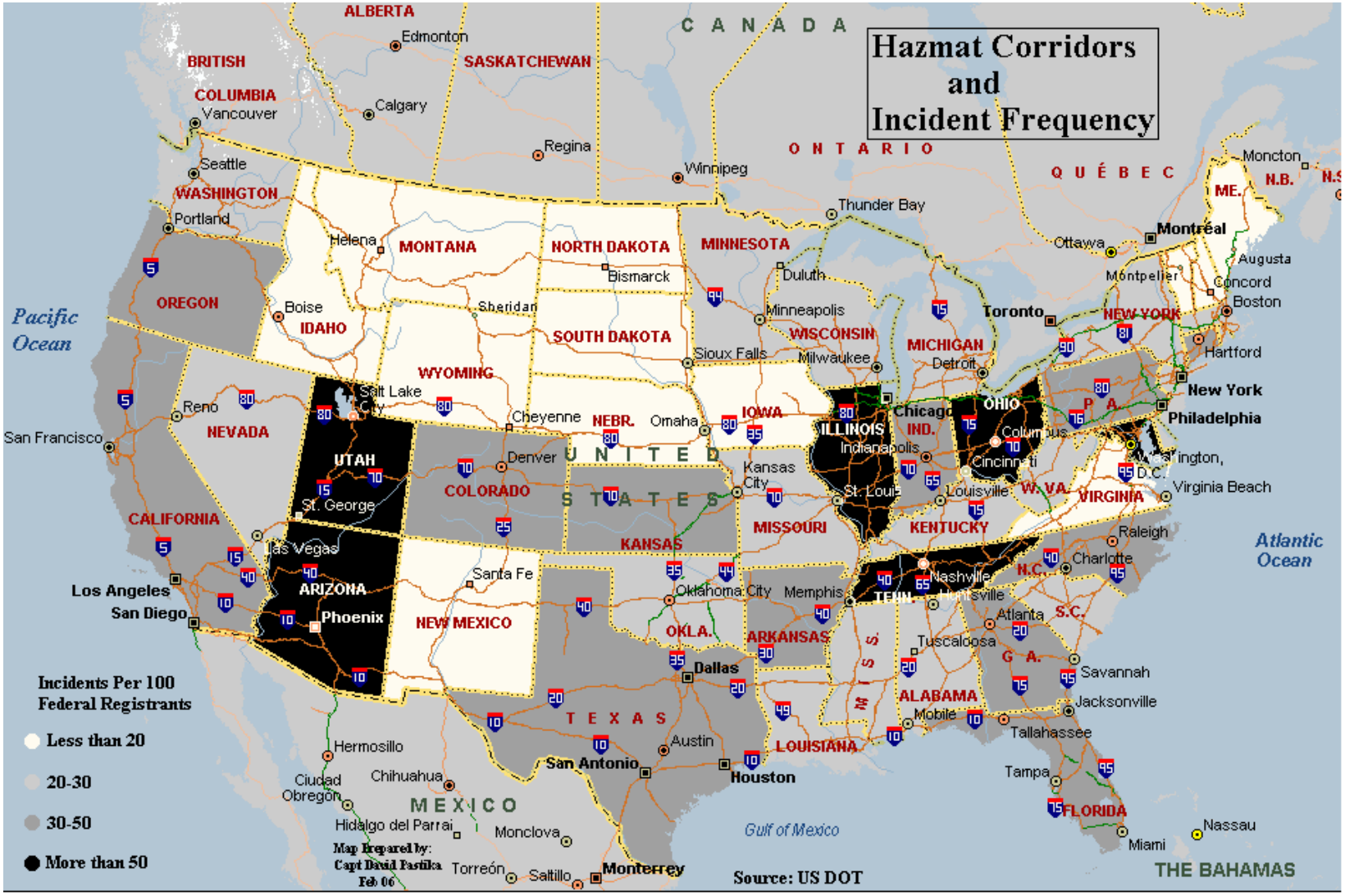

Figure 21. Hazmat Corridors and Incident Frequency

Due to the fact that the size of each state's hazmat carrier fleet is a factor in contributing to a certain percentage of incidents within any given state, a simple ratio of incidents per 100 Federal registrations is incorporated in Figure 20. By factoring out differences in size of Federal hazmat registrations by state, the map now depicts the pattern of incidents as a ratio with higher numbers representing higher incident rates.

Since there is no direct way to measure traffic corridors, this representation makes use of the available data and transfers the pattern shown in Figure 20 to form the lowest layer of information on Figure 21. Major interstates and highways are then overlaid upon the existing data and resulting pattern from Figure 20 to depict possible transportation routes within and around states with the highest concentrations of hazmat incidents. Many factors are responsible for hazmat incidents such as congestion, road conditions, weather, and routing while the data obtained about incidents does contain detailed accident information, this research does not incorporate this data or account for these factors.

Summary

This chapter summarized the results of the analyzed data collected through the meta-analysis to answer the initial six investigative questions proposed by this research. Through the collection of meta-data, interviews, a case study and other archival and primary data, the investigative questions were answered and culminated in a series of maps that displayed various aspects of the hazmat realm.

V. Conclusion and Recommendations

Overview:

This chapter provides a concise summary of the research and analysis conducted for this thesis. It answers the overall research question, summarizes the findings, displays the significance of this investigation and makes recommendations for future research in this field of study.

Research Summary

This research attempted to answer the following question: Are state hazmat regulations becoming more restrictive and would an in-depth analysis of these regulations aid in the understanding and compliance of the complex set of rules currently in place for this industry? Six investigative questions were utilized to each provide insight to the overall research question. Investigative questions one and two looked at the history and changes of regulations at the Federal level and compared them over the past decade to the effects that those changes have brought upon the states. The events of September 11th, 2001 were also factored in and hazmat changes as a result of the 9/11 attacks were documented. Investigative questions three and four sought to seek out patterns of inconsistency amongst states and to identify any unusually restrictive state regulations that may impede hazmat commerce between states. Investigative question five queried state cooperation efforts in regards to hazmat legislation or streamlining efforts to ease the burden of so many inconsistent regulations amongst states. Finally, investigative question six tied snippets of each previous investigative question together to form a

picture of where hazmat seems to be moving about the country via highways and interstate routes based upon data gathered from Federal hazmat registrations and incident reports.

Findings

This research concluded that state hazmat regulations are becoming more restrictive for a number of reasons. Nearly twenty years ago, Congress and the DOT first acted upon the realization that incongruent state hazmat policies, regulations, and practices were impeding the efficient economic progress of the hazmat industry. Federal legislation had already adopted a practice of pre-emption which protected the hazmat industry from undue economic burden, but there were many loopholes through which states were allowed practically unfettered rights to governing their respective hazmat programs. That changed in 1990 when Congress and the DOT threatened states with a one-size fits all approach to hazmat regulation at the state level. Congress, DOT, and the states meted out a compromise that created the Alliance for Uniform Transportation Procedures. States would voluntarily join the Alliance and work together to cooperatively create synonymous legislation, registration and permit procedures, forms, and other tools to realize efficiencies within their hazmat programs. As of 15 Feb 2006, only seven states have joined with one pending induction and two more considering membership.

With each successive Federal Safety Reauthorization Act, state legislatures must adopt the new Federal regulations and then decide to amend their own state programs to mirror the Federal guidelines or leave them less restrictive as the Federal law permits. An

increased tempo of Safety Authorization Act issuances over the past decade has created many differences between state programs, even within the Alliance states, due to the speed at which states are able to get legislation passed. This fact alone has sustained most of the inconsistency between state hazmat regulations, but others include differences in states' hazmat organizational structures, permit and registration requirements for different hazmat materials, and hazmat program size.

Overall Research Conclusion

The DOT has made strides to catch up to the years of mounting dissimilarities between states' hazmat programs by conducting research through its former Research and Special Programs Administration. Battelle was commissioned to conduct a Compliance Effectiveness Study in 2003 for the RSPA and immediately following the results of the study, DOT issued a guide for creating a model state hazmat program. Clearly, as the Battelle report shows, more research effort is needed for studying the myriad of complex relationships that have formed at the state level in regards to hazardous materials regulations and the subtle but important differences from the Federal legislation. Without these first steps toward standardization, states will continue to be differentiated from one another with each successive Federal Safety Reauthorization Act.

Significance of Research

Throughout interviews with state officials from the Alliance states, it became clear that not many researchers were conducting investigations into this particular niche of transportation research. One of the early goals of this thesis was to create a tool or a

compendium for future researchers, hazmat officials, shippers, and transporters to be able to act as a starting point for answering some questions about hazmat regulations and their differences between states. As is the nature of hazmat regulations, rules and laws change constantly and trying to create such a tool merely serves as a snapshot of a fast moving object. The real significance of this research lies in the way the information was collected, analyzed, and presented. The meta-analysis approach took information from many unlikely sources and combined them into the maps and charts presented at the end of chapter four. Six investigative questions and one overall research question have been answered thus adding knowledge to this otherwise largely uninvestigated research area.

Recommendations for Future Research

This investigation has merely probed the surface of possible topics within the hazmat regulation research arena. Much was gleaned from DOT databases but much more data was unused. A detailed list of every Federally registered hazardous materials transporter including phone number and address is included in the same databases used for this research. A readily available pool of hazmat trucking companies could be surveyed to ascertain perceptions about hazmat regulations by state, the routes they frequently transport hazardous materials along (greatly updating the map generated for this research), and barriers to efficient commerce.

Another area for future hazmat research is at the city and local levels. Cities such as Baltimore, Cleveland, and Washington D.C. have recently exercised their power in passing legislation that restricts hazardous materials from being routed through their cities. With the current Federal regulations just now beginning to reflect the changes to

hazmat procedures since 9/11, this may prove to be an interesting and worthwhile research endeavor.

Finally, the information obtained through the use of interviews with state officials proved to be invaluable. Interview questions one, three, and four tended to be more useful than the others in providing unique details. Some additional questions for the remaining 43 states and Washington D.C. might be:

1. Which state agencies are involved with your state's hazmat program (DOT, Highway Patrol, DMV, etc) and is there a focal point or office that directs these activities? If not, how do these agencies communicate with one another?
2. What routes are the most traveled amongst hazmat drivers in your state?
3. What are the top three violations found during roadside hazmat inspections?
4. Has your state considered joining the Alliance and if not, why?
5. How does your state feel about the trend of increasing Federal pre-emption on your state's rights to administer your own hazmat program?
6. Would your state be in favor of a Federal level uniform hazmat program… why or why not?

Summary

This chapter summarized the research accomplishments and answered the overarching research question. It presented the findings of this study and expressed the contributions of this research to the overall body of knowledge in the field of hazmat transportation. Finally, areas for future and follow-up research were presented.

APPENDIX A[i]

Hazmat Classes and Divisions

Class 1 Explosives - *49CFR 173.50*

Division 1.1 Explosives

Consists of explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

Division 1.2 Explosives

Consists of explosives that have a projection hazard but not a mass explosion hazard.

Division 1.3 Explosives

Consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or, both but not a mass explosion hazard.

Division 1.4 Explosives

Consists of explosives that present a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5 Explosives

Consists of very insensitive explosives. This division is comprised of substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

Division 1.6 Explosives

Consists of extremely insensitive articles which do not have a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

Class 2 Compressed Gasses - *49CFR 173.115*

Division 2.1 Flammable Gas – 49 CFR 173.115(a)

454 kg (1001 lbs) of any material which is a gas at 20°C (68°F) or less and 101.3 kPa (14.7 psi) of pressure (a material which has a boiling point of 20°C (68°F) or less at 101.3 kPa (14.7 psi)) which-

1. Is ignitable at 101.3 kPa (14.7 psi) when in a mixture of 13 percent or less by volume with air; or
2. Has a flammable range at 101.3 kPa (14.7 psi) with air of at least 12 percent regardless of the lower limit.

Except for aerosols, the limits specified in paragraphs (a)(1) and (a)(2) of this section shall be determined at 101.3 kPa (14.7 psi) of pressure and a temperature of 20°C (68°F) in accordance with ASTM E681-85, Standard Test Method for Concentration Limits of Flammability of Chemicals or other equivalent method approved by the Associate Administrator for Hazardous Materials Safety. The flammability of aerosols is determined by the tests specified in 49CFR 173.306(i).

Division 2.2 Non-Flammable, Non-Poisonous Gas – 49 CFR 173.115(b)

This division includes compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyxiant gas and oxidizing gas. A non-flammable, nonpoisonous compressed gas (Division 2.2) means any material (or mixture) which-

1. Exerts in the packaging an absolute pressure of 280 kPa (40.6 psi) or greater at 20°C (68°F), and

2. Does not meet the definition of Division 2.1 or 2.3.

Division 2.2 Oxygen – 49 CFR 173.115(b)

This is an optional placard to the 2.2 Non-flammable Gas placard for compressed Oxygen in either the gas or liquid state. Oxygen is considered a non-flammable because it in and of itself does not burn. It is, however, required for combustion to take place. High concentrations of oxygen greatly increases the rate and intensity of combustion.

Division 2.3 Poison Gas – 49 CFR 173.115(b)

Gas poisonous by inhalation means a material which is a gas at 20°C or less and a pressure of 101.3 kPa (a material which has a boiling point of 20°C or less at 101.3kPa (14.7 psi)) and which:

1. Is known to be so toxic to humans as to pose a hazard to health during transportation, or
2. In the absence of adequate data on human toxicity, is presumed to be toxic to humans because when tested on laboratory animals it has an LC_{50} (Lethal Concentration) value of not more than 5000 ml/m^3.

Class 3 Flammable Liquids - *49CFR 173.120*

Flammable Liquid – 49 CFR 173.120(a)

A flammable liquid (Class 3) means a liquid having a flash point of not more than 60.5°C (141°F), or any material in a liquid phase with a flash point at or above 37.8°C (100°F) that is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging, with the following exceptions:

1. Any liquid meeting one of the definitions specified in 49CFR 173.115.
2. Any mixture having one or more components with a flash point of 60.5°C (141°F) or higher, that make up at least 99 percent of the total volume of the mixture, if the mixture is not offered for transportation or transported at or above its flash point.
3. Any liquid with a flash point greater than 35°C (95°F) which does not sustain combustion according to ASTM 4206 or the procedure in Appendix H of this part.
4. Any liquid with a flash point greater than 35°C (95°F) and with a fire point greater than 100°C (212°F) according to ISO 2592.
5. Any liquid with a flash point greater than 35°C (95°F) which is in a water-miscible solution with a water content of more than 90 percent by mass.

Combustible Liquid – 49 CFR 173.120(b)(1)

1. For the purpose of this subchapter, a combustible liquid means any liquid that does not meet the definition of any other hazard class specified in this subchapter and has a flash point above 60.5°C (141°F) and below 93°C (200°F).
2. A flammable liquid with a flash point at or above 38°C (100°F) that does not meet the definition of any other hazard class may be reclassed as a combustible liquid. This provision does not apply to transportation by vessel or aircraft, except where other means of transportation is impracticable. An elevated temperature material that meets the definition of a Class 3 material because it is intentionally heated and offered for transportation or transported at or above its flash point may not be reclassed as a combustible liquid.

3. A combustible liquid which does not sustain combustion is not subject to the requirements of this subchapter as a combustible liquid. Either the test method specified in ASTM 4206 or the procedure in Appendix H of this part may be used to determine if a material sustains combustion when heated under test conditions and exposed to an external source of flame.

Gasoline and Fuel Oil

These placards are alternative placards, which may be used for gasoline or fuel oil in non-bulk quantities.

Class 4 Flammable Solids - *49CFR 173.124*

Division 4.1 Flammable Solid - 49CFR 173.124(a)

Flammable solid (Division 4.1) means any of the following three types of materials:

1. Desensitized explosives that-
    i. When dry are Explosives of Class 1 other than those of compatibility group A, which are wetted with sufficient water, alcohol, or plasticizer to suppress explosive properties; and

ii. Are specifically authorized by name either in the 49CFR 172.101 Table or have been assigned a shipping name and hazard class by the Associate Administrator for Hazardous Materials Safety under the provisions of-
    A. An exemption issued under subchapter A of this chapter; or
    B. An approval issued under 49CFR 173.56(i) of this part.

iii. Self-reactive materials are materials that are thermally unstable and that can undergo a strongly exothermic decomposition even without participation of oxygen (air). A material is excluded from this definition if any of the following applies:
    A. The material meets the definition of an explosive as prescribed in subpart C of this part, in which case it must be classed as an explosive;
    B. The material is forbidden from being offered for transportation according to 49CFR 172.101 of this subchapter or 49CFR 173.21;
    C. The material meets the definition of an oxidizer or organic peroxide as prescribed in subpart D of this part, in which case it must be so classed;
    D. The material meets one of the following conditions:
        1. Its heat of decomposition is less than 300 J/g; or
        2. Its self-accelerating decomposition temperature (SADT) is greater than 75°C (167°F) for a 50 kg package; or
    E. The Associate Administrator for Hazardous Materials Safety has determined that the material does not present a hazard which is associated with a Division 4.1 material.

iv. Generic types. Division 4.1 self-reactive materials are assigned to a generic system consisting of seven types. A self-reactive substance identified by technical name in the Self-Reactive Materials Table in 49CFR 173.224 is assigned to a generic type in accordance with that Table. Self-reactive materials not identified in the Self-Reactive Materials Table in 49CFR 173.224 are assigned to generic types under the procedures of paragraph (a)(2)(iii) of this section.
    A. Type A. Self-reactive material type A is a self-reactive material which, as packaged for transportation, can detonate or deflagrate rapidly. Transportation of type A self-reactive material is forbidden.
    B. Type B. Self-reactive material type B is a self-reactive material which, as packaged for transportation, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in a package.
    C. Type C. Self-reactive material type C is a self-reactive material which, as packaged for transportation, neither detonates nor deflagrates rapidly and cannot undergo a thermal explosion.
    D. Type D. Self-reactive material type D is a self-reactive material which-
        1. Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement;

2. Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or
3. Does not detonate or deflagrate at all and shows a medium effect when heated under confinement.

E. Type E. Self-reactive material type E is a self-reactive material which, in laboratory testing, neither detonates nor deflagrates at all and shows only a low or no effect when heated under confinement.

F. Type F. Self-reactive material type F is a self-reactive material which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power.

G. Type G. Self-reactive material type G is a self-reactive material which, in laboratory testing, does not detonate in the cavitated state, will not deflagrate at all, shows no effect when heated under confinement, nor shows any explosive power. A type G self-reactive material is not subject to the requirements of this subchapter for self-reactive material of Division 4.1 provided that it is thermally stable (self-accelerating decomposition temperature is 50 °C (122 °F) or higher for a 50 kg (110 pounds) package). A self-reactive material meeting all characteristics of type G except thermal stability is classed as a type F self-reactive, temperature control material.

v. Procedures for assigning a self-reactive material to a generic type. A self-reactive material must be assigned to a generic type based on-

A. Its physical state (i.e. liquid or solid), in accordance with the definition of liquid and solid in 49CFR 171.8 of this subchapter;

B. A determination as to its control temperature and emergency temperature, if any, under the provisions of 49CFR 173.21(f);

C. Performance of the self-reactive material under the test procedures specified in the UN Recommendations on the Transport of Dangerous Goods, Tests and Criteria and the provisions of paragraph (a)(2)(iii) of this section; and

D. Except for a self-reactive material which is identified by technical name in the Self-Reactive Materials Table in 49CFR 173.224(b) or a self-reactive material which may be shipped as a sample under the provisions of 49CFR 173.224, the self-reactive material is approved in writing by the Associate Administrator for Hazardous Materials Safety. The person requesting approval shall submit to the Associate Administrator for Hazardous Materials Safety the tentative shipping description and generic type and-

1. All relevant data concerning physical state, temperature controls, and tests results; or
2. An approval issued for the self-reactive material by the competent authority of a foreign government.

vi. Tests. The generic type for a self-reactive material must be determined using the testing protocol from Figure 14.2 (Flow Chart for Assigning

Self-Reactive Substances to Division 4.1) from the UN Recommendations on the Transport of Dangerous Goods, Tests and Criteria.

2. Readily combustible solids are materials that-
    i. Are solids which may cause a fire through friction, such as matches;
    ii. Show a burning rate faster than 2.2 mm (0.087 inches) per second when tested in accordance with UN Manual of Tests and Criteria; or
    iii. Any metal powders that can be ignited and react over the whole length of a sample in 10 minutes or less, when tested in accordance with UN Manual of Tests and Criteria.

Division 4.2 Spontaneously Combustible - 49CFR 173.124(b)

Spontaneously combustible material (Division 4.2) means-

1. A pyrophoric material. A pyrophoric material is a liquid or solid that, even in small quantities and without an external ignition source, can ignite within five (5) minutes after coming in contact with air when tested according to the UN Manual of Tests and Criteria.
2. A self-heating material. A self-heating material is a material that, when in contact with air and without an energy supply, is liable to self-heat. A material of this type which exhibits spontaneous ignition or if the temperature of the sample exceeds 200 °C (392 °F) during the 24-hour test period when tested in accordance with paragraph 3.b.(1) of appendix E to this part, is classed as a Division 4.2 material.

Division 4.3 Dangerous When We t- 49CFR 173.124(c)

Dangerous when wet material (Division 4.3) means a material that, by contact with water, is liable to become spontaneously flammable or to give off flammable or toxic gas at a rate greater than 1 liter per kilogram of the material, per hour, when tested in accordance with UN (United Nations) Manual of Tests and Criteria.

Class 5 Oxidizers - *49CFR 173.127*

Division5.1 Oxidizers – 49CFR 173.127(a)

Oxidizer (Division 5.1) means a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials.

1. A solid material is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria, its mean burning time is less than or equal to the burning time of a 3:7 potassium bromate/cellulose mixture.
2. A liquid material is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria, it spontaneously ignites or its mean time for a pressure rise from 690 kPa to 2070 kPa gauge is less then the time of a 1:1 nitric acid (65 percent)/cellulose mixture.

Division 5.2 Organic Peroxide - 49CFR173.128(a)

Organic peroxide (Division 5.2) means any organic compound containing oxygen (O) in the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals, unless any of the following paragraphs applies:

1. The material meets the definition of an explosive as prescribed in subpart C of this part, in which case it must be classed as an explosive;
2. The material is forbidden from being offered for transportation according to 49CFR 172.101 of this subchapter or 49CFR 173.21;

3. The Associate Administrator for Hazardous Materials Safety has determined that the material does not present a hazard which is associated with a Division 5.2 material; or
4. The material meets one of the following conditions:
   i. For materials containing no more than 1.0 percent hydrogen peroxide, the available oxygen, as calculated using the equation in paragraph (a)(4)(ii) of this section, is not more than 1.0 percent, or
   ii. For materials containing more than 1.0 percent but not more than 7.0 percent hydrogen peroxide, the available oxygen, content (Oa) is not more than 0.5 percent, when determined using the equation:

$$O_a = 16 \times \sum_{i=1}^{k} \frac{n_i c_i}{m_i}$$

where, for a material containing k species of organic peroxides:
ni=number of -O-O- groups per molecule of the ith species
ci=concentration (mass percent) of the ith species
mi=molecular mass of the ith species

Class 6 Poisons - *49CFR 173.132*

Poisons are perhaps the second most complex hazard class with respect to packaging, regulations and compatibility. The following definitions only represent the basic outline of the regulation as outlined in 49 CFR and omit many technical aspects such as lethal dose 50 (LD_{50}) for toxicity and assignment groups for packaging and hazard zones.

Poisonous material (Division 6.1) means a material, other than a gas, which is known to be so toxic to humans as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity:

1. Is presumed to be toxic to humans because it falls within any one of the following categories when tested on laboratory animals (whenever possible, animal test data that has been reported in the chemical literature should be used):
    i. Oral Toxicity. A liquid with an LD_{50} for acute oral toxicity of not more than 500 mg/kg or a solid with an LD_{50} for acute oral toxicity of not more than 200 mg/kg.
    ii. Dermal Toxicity. A material with an LD_{50} for acute dermal toxicity of not more than 1000 mg/kg.
    iii. Inhalation Toxicity.
        A. A dust or mist with an LC_{50} for acute toxicity on inhalation of not more than 10 mg/L; or
        B. A material with a saturated vapor concentration in air at 20 °C (68 °F) of more than one-fifth of the LC_{50} for acute toxicity on inhalation of vapors and with an LC_{50} for acute toxicity on inhalation of vapors of not more than 5000 ml/m³; or
2. Is an irritating material, with properties similar to tear gas, which causes extreme irritation, especially in confined spaces.

Inhalation Hazard – 49CFR 173.132

Placards must be placed for any quantity of a material that is in Hazard Zone A or B.

Poison – 49CFR 173.132

454 kg (1001 lbs.) or more gross weight of poisonous materials that are not in Hazard Zone A or B

Toxic – 49CFR 173.132

May be used instead of POISON placard on 454 kg (1001 lbs.) or more gross weight of poisonous materials that are not in Hazard Zone A or B

Packing Group III (PG III) – 49CFR 173.132

May be used instead of POISON placard on 454 kg (1001 lbs.) or more gross weight of Poison PG III materials

Class 7 Radioactive Materials- ***49CFR Subpart I***

Radiological materials are the most complex class of materials with respect to regulation in 49 CFR. As with poisons in Class 6, only the basic regulation outlines and associated placards will be included in this thesis. 49 CFR includes many subparts that address the myriad of issues and definitions of radioactive materials.

Radioactive

Any quantity of packages bearing the RADIOACTIVE YELLOW III label (LSA-III).

Some radioactive materials in "exclusive use" with low specific activity radioactive materials will not bear the label, however, the RADIOACTIVE placard is required.

Class 8 Corrosive Liquids - *49CFR 173.136*

a. For the purpose of this subchapter "corrosive materials" (Class 8) means a liquid or solid that causes full thickness destruction of human skin at the site of contact within a specified period of time. A liquid that has a severe corrosion rate on steel or aluminum based on the criteria in 49CFR 173.137(c)(2) is also a corrosive material.
b. If human experience or other data indicate that the hazard of a material is greater or less than indicated by the results of the tests specified in paragraph (a) of this section, RSPA may revise its classification or make the determination that the material is not subject to the requirements of this subchapter.
c. Skin corrosion test data produced no later than September 30, 1995, using the procedures of 49CFR 173, Appendix A, in effect on September 30, 1995 (see 49CFR Part 173, Appendix A, revised as of October 1, 1994) for appropriate exposure times may be used for classification and assignment of packing group for Class 8 materials corrosive to skin.

Corrosive

454 kg (1001 lbs) or more gross weight of a corrosive material. Although the corrosive class includes both acids and bases, the hazardous materials load and segregation chart does not make any reference to the separation of various incompatible corrosive materials from each other. In spite of this, however, when shipping corrosives care should be taken to ensure that incompatible corrosive materials can not become mixed as many corrosives react very violently if mixed. If responding to a transportation incident involving corrosive materials (especially a mixture of corrosives), caution should be exercised.

Class 9 Miscellaneous - ***49CFR 173.140***

A material which presents a hazard during transportation but which does not meet the definition of any other hazard class. This class includes:

a. Any material which has an anesthetic, noxious or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties; or
b. Any material that meets the definition in 49CFR 171.8 of this subchapter for an elevated temperature material, a hazardous substance, a hazardous waste, or a marine pollutant.

[i] All material in this Appendix is cited as follows: Kenneth Barbalace. US DOT Hazardous Materials Transportation Placards. EnvironmentalChemistry.com. 1995 - 2006. Accessed on-line: 1/12/2006 http://EnvironmentalChemistry.com/yogi/hazmat/placards/index.html

APPENDIX B

Federal Hazmat Bill Comparison Sections 5101-5127

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5101. Purpose. "...to provide adequate protection against risks to life and property inherent in the transportation of hazardous material in commerce by improving the regulatory and enforcement authority of the Secretary of Transportation."	Unchanged	Changes the purpose to – (1) "ensure the safe and efficient transportation of hazardous material in intrastate, interstate and foreign commerce..." (2) "provide the Secretary of Transportation with preemption authority..." (3) "provide adequate training for public sector emergency response teams and hazmat employees..."	Changes the purpose to - (1) state that Federal hazmat law protects against risks to life, property and, in addition, the environment (2) clarify that the Secretary has the authority to regulate "intrastate, interstate, and foreign commerce"
§5102. Definitions. "Commerce" means trade or transportation...	Adds "on a United States registered aircraft"	Same changes as in 1997 Administration bill	Same proposed change as in 1997 and 1999 Administration bill
§5102. Definitions. "Hazmat employee" (1) includes an individual employed by a hazmat employer or who directly affects hazardous material transportation safety (2) includes owner-operator of motor vehicle (3) includes individuals who perform various hazmat functions, including manufacture, recondition, or test containers, drums and packagings and preparing hazmat for transportation	(1) Also includes individuals who are self- employed (2) Deletes "who during the course of employment directly affects hazardous material transportation safety as the Secretary decides" (3) changes preparing hazmat for transportation to "performs any function pertaining to the offering of hazardous material for transportation"	(1) Also includes individuals who are self-employed (2) In addition to including owner-operator of a motor vehicle, includes owner-operators of a vessel or aircraft (3) Under individuals who perform hazmat functions, includes those who also designs and inspects packaging, or a component thereof (4) changes preparing hazmat for transportation to "prepares or rejects hazardous material for transportation"	The definition of "hazmat employee" is amended to: (1) include persons who are used by a hazmat employer. (2) include an owner-operator of a vessel or aircraft, in addition to an owner-operator of a motor vehicle, transporting hazmat in commerce. (3) delete the list of hazmat activities that subject a hazmat employee to regulation and, instead, refer to activities regulated by the Secretary under 5103(b).
§5102. Definitions. "Hazmat employer" (1) A person using at least 1 employee in connection with transporting hazmat in commerce or causing it to be transported in commerce (2) includes owner-operator of a motor vehicle transporting hazmat (3) includes employers who perform hazmat functions,, including causing hazmat to be transported in commerce and a person manufacturing, reconditioning or testing containers, drums or packagings represented as qualified for use in transporting hazmat (4) Includes a department, agency or instrumentality of the US govt...	(1) Also includes a person who is self-employed	(1) Also includes a person who is self-employed (2) Includes owner-operator of a motor vehicle, vessel, or aircraft (3) Under individuals who perform hazmat functions, includes a person performing a function in connection with "rejecting hazardous material for transportation in commerce" and includes those who also design and inspect packaging, or a component thereof (4) deletes "includes a department agency or instrumentality of the United States government...."	The definition of "hazmat employer" is amended to include: (1) a person who has at least one hazmat employee; or (2) a person who is self-employed, including an owner-operator of a motor vehicle, vessel, or aircraft transporting hazmat in commerce; and (3) who performs an activity regulated by the Secretary under § 5103(b).
§5102. Definitions. Motor carrier. Includes a motor carrier, motor private carrier and a freight forwarder.	(1) Includes a motor common carrier, motor contract carrier, motor private carrier, and freight forwarder. (2) Limits the inclusion of a freight forwarder to only those performing a function related to highway transportation	(1) Same as present law BUT (2) Limits the inclusion of a freight forwarder to only those performing a function related to highway transportation	Same proposed changes as in 1999 Administration bill
§ 5120. Definitions. National Response Team			Proposes editorial changes for clarity
§5102. Definitions. Does not include a definition for out-of-service order, package, or packaging	Adds a definition for (1) out-of-service order – "a mandate that an aircraft, vessel, motor vehicle, train, other vehicle, or part of any of these, not be moved until ..." (2) package (3) packaging	Adds a definition for (1) out-of-service order - "a mandate that an aircraft, vessel, motor vehicle, train, railcar, other vehicle, transport unit, transport vehicle, freight container, portable tank, or other package not be moved until..." (2) package (3) packaging	Does not propose a definition for "out-of-service order" in this section. Section 19 of the 2001 Administration bill proposes to add a definition in section 5121 of Federal hazmat law.

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5102. Definitions. Person. Includes a government, etc. offering hazmat in commerce or transporting hazmat to further a commercial enterprise	Also includes a person "manufacturing, reconditioning or testing containers, drums or other packagings represented as qualified for use in transporting hazardous material."	Also includes a person "manufacturing, reconditioning or testing containers, drums, or other packagings, or a component thereof, represented as qualified for use in transporting hazardous material."	Includes a person "manufacturing, designing, inspecting, testing, reconditioning, marking, or repairing a packaging or packaging component represented as qualified for use in transporting hazardous materials in commerce
§5103. General regulatory authority	No changes	No changes	In (a), updates terminology used to reference certain hazardous materials In (b), redefines the list of persons subject to regulation under Federal hazmat law and the HMR to include a person who: (1) transports a hazardous material in commerce; (2) causes a hazardous material to be transported in commerce; (3) manufactures, designs, inspects, tests, reconditions, marks, or repairs a packaging or packaging component represented as qualified for use in transporting hazardous material in commerce; (4) prepares, accepts, or rejects hazardous material for transportation in commerce; (5) is responsible for the safety of transporting hazardous material in commerce; (6)certifies compliance with any requirement issued under this chapter; or (7)misrepresents whether it is engaged in any of the above activities.
§5104. Representation and tampering	No changes	No changes	Proposes editorial changes for clarity
§5105. Transporting certain highly radioactive material. Includes a provision for a routes and modes study	Includes a provision for a routes and modes study	Deletes the provision for a routes and modes study	Deletes (d),which requires a routes and modes study Deletes (e), which requires the Secretary to issue regulations for the inspection of motor vehicles transporting certain hazardous materials
§5106. Handling criteria.	Deletes this section.	Retains this section	Deletes this section
§5107. Hazmat employee training requirements and grants (d) Coordination of training requirements. ...The Administrator of the EPA, the Secretaries of Labor and Transportation shall ensure that the training requirements do not conflict or duplicate...the regulations the Agency prescribes related to worker protection standards (e) Training grants. Funds shall be available under §5127(c)(3) (f) Relationship to other laws. (2) "An action of the Secretary of Transportation under ... sections 5106, 5108(a)-(g)(1) and (h), and 5109..."	(f)(2) Alters the sections to exclude 5106 and read "5108(c)-(g)(1) and (h) or 5109..."	(d) Deletes the words "or duplicate" and specifies that the "Agency" is the "Administrator of the Environmental Protection Agency" (e). Deletes "§5127(c)(3)" and inserts "5129(b)(1)"	Deletes "or duplicate" in (d) In (e), changes "5127(c)(3)" to "5128," to reflect that the appropriations section has moved In (f)(2), deletes "section 5106, 5108(c)-(g)(1) and (h), and 5109" to clarify that DOT and OSHA share jurisdiction over hazmat employee training only [Section 8 of the Administration bill would clarify that OSHA retains authority over hazmat employee training and the occupational safety/health protection of employees responding to a hazmat release.]

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5108. Registration. (b)(1)(C). "each State in which the person carries out the activity." (c)(1). Filing deadlines and Amendments. Each person required to file, "must file that first statement not later than 3/31/92. The Secretary may extend that date to 9/30/92, for activities referred to in subsection (a)(1) of this section. A person shall renew the statement consistent with regulations the Secretary prescribes, but not more than once each year and not less than once every 5 years." (c)(2) "The Secretary of Transportation shall decide by regulation when and under what circumstances a registration statement must be amended and the procedures to follow in amending the statement." (g)(2)(A) Fees. "...the fee shall be at least $250 but not more than $5000 from each person..." (g)(2)(A)(viii) "...the amount to be made available to carry out sections 5108(g)(2), 5115, and 5116 of this title." (g)(2)(B) "The Secretary of Transportation shall adjust the amount being collected to reflect any unexpended balance in the account established under 5116(I) of this title. However, the Secretary is not required to refund any fee collected under this paragraph." ...	(b)(1)(C) "each State in which the person carries out any of the activities." (c)(1) Filing Schedule -- Each person required to file, "shall file that statement annually in accordance with the regulations issued by the Secretary."	(b)(1)(C) Same as 1997 (c)(1) Filing Schedule -- Each person required to file, "shall file that statement in accordance with the regulations issued by the Secretary." (c)(2) Deleted (g)(2)(A) "...the fee shall be at least $500 from each person..." (g)(2)A)(viii) "...the amount to be made available to carry out chapter 51 (except sections 5109, 5112, and 5119) of this title." (g)(2)(B) Revises section to read "At the beginning of each fiscal year, the Secretary of Transportation shall publish a fee schedule for the fee established under this paragraph. The fee schedule shall be designed to collect the following amounts." (g)(2)(C) Deletes language in present law and inserts "The Secretary shall transfer to the Secretary of the Treasury all funds received by the Secretary under this paragraph, except the amounts appropriated to RSPA pursuant to subsection 5129(a)(2), for deposit in the account the Secretary of the	In (a)(1)((B), updates terminology used to reference certain hazmat In (a)(2)(B), adds persons who design or inspect hazmat packagings to the list of persons subject to registration requirements. Deletes persons who "fabricate" – term is redundant with "manufacture" and "design" Makes editorial change to (b)(1)(C) Deletes (c)(2) and revises (c)(1) to reflect that registration statements must be filed in accordance with the HMR Makes editorial changes to (g)(1) Amends (i) to exclude Indian tribes from the registration requirements
(§5108 cont'd.) (g)(2)(C) "The Secretary of Transportation shall transfer to the Secretary of the Treasury amounts the Secretary of Transportation collects under this paragraph for deposit in the account established under 5116(I) of this title." (i)(2)(B) The section does not apply to an authority of a State, or political subdivision of a State...		(§ 5108 cont'd) Treasury established under section 5116(I) of this title." (g)(2)(D) Adds a section discussing fees collected under (g)(2)(B)(ii). (g)(2)(E) Adds a section telling the Secretary to adjust the amount being collected under 5108(g)(2)(B) to reflect any unexpended balance in the account established in 5116(I) (i)(2)(B) The section does not apply to "an authority of a State, Indian tribe, or political subdivision of a State..."	
§5109 Motor Carrier Safety permits (h)" The Secretary shall prescribe regulations necessary to carry out this section not later than November 16, 1991."	Deletes this section	Includes entire section as in present hazmat law, but changes paragraph (h) "The Secretary shall prescribe regulations necessary to carry out this section based upon the findings of the study required by section 5128(a) of this title."	Deletes this section
§5110 Shipping papers and disclosure (e) "Retention of papers. After the hazardous material to which a shipping paper provided to a carrier under subsection (a) applies is no longer in transportation, the person who provided the shipping paper and the carrier required to maintain it under subsection (a) shall retain the paper or electronic image thereof for a period of 1 year to be accessible through their respective principle places of business. Such person and carrier shall, upon request, make the shipping paper available to a Federal, State, or local government agency at reasonable times and locations."	(e) Deletes section and replaces it with "Retention of Shipping papers. After expiration of the requirement of subsection (c) of this section, the person who provided the shipping paper and the carrier required to maintain it under subsection(a) of this section shall retain the paper or an electronic image thereof, for a period of 1 year after the shipping paper was provided to the carrier to be accessible through their respective principle places of business."	(e) Deletes old section and replaces it with "Retention of papers. The person who provided the shipping paper and the carrier required to maintain it under subsection (a) of this section shall retain the paper, or an electronic image of it, for a period of 1 year after the shipping paper was provided to the carrier, to be accessible through their respective principal places of business. Such person and carrier shall, upon request, make the shipping paper available to a Federal, State, or local government agency at reasonable times and locations."	Amends (a) to state that shipping papers must be prepared in accordance with the HMR Deletes (b) Redesignates (c),(d), and (e) as (b), (c) and (d) Revises (d), as redesignated, to require retention of shipping papers for 3 years from the date the papers are provided to the carrier
§5111. Rail Tank Cars	No changes	No changes	Deletes this section
§5112. Highway Routing of hazmat	No changes	No changes	No changes
§5113. Unsatisfactory safety rating. "See section 31144."	Includes subsections that are no longer in the present law on prohibited transportation, rating review, prohibited government use and public availability and updating of ratings	Deletes language and inserts "A violation of section 31144(c)(3) of this title shall be considered a violation of this chapter and shall be subject to the penalties in sections 5123 and 5124 of this chapter." * Note – the law also alters 49 U.S.C. §31144(c)(3)	Revises both 5113 and 49 U.S.C. 3114(c)(3) of the Motor Carrier Safety Act to clarify that a violation of 49 U.S.C. 3114(c)(3) constitutes a violation of Federal hazmat law Redesignates subsection (c) of 49 U.S.C. 3114 (the second time it appears-- erroneously-- in that section) as 3114(f)
§5114. Air transportation of ionizing radiation material	No changes	No changes	No changes

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5115. Training curriculum for the public sector. (a) Development and Updating. Sets a time limit of 11/16/92. Discusses using the existing coordinating mechanisms of the national response team. Allows the Secretary of Transportation to consult with regional response teams, representative of commissions and persons that provide training for responding to accidents and incidents involving the transportation of hazmat and representative of persons that respond to accidents and incidents in developing the curriculum. (b) "Requirements. The curriculum developed..." (b)(1)(A)&(B) Discuss developing a curriculum to help public sector employees respond quickly to an accident or incident involving the transportation of hazardous material (b)(1)(C) Discusses including in the curriculum programs that are developed under other U.S. Government grant programs, including those developed under section 126(g) of Superfund. prescribed by the National Fire Protection Association.	(a) Updating. Deletes the time limit. Does not discuss developing and updating a curriculum, only discusses updating a curriculum. The section allowing the Secretary to consult various people in developing the curriculum is deleted. (b) deletes developed (b)(1)(A)&(B) In addition to training employees to respond to an accident or incident involving the transportation of hazardous material, they should also be trained in responding to accidents or incidents involving an alternative fuel vehicle. (b)(1)(C) No changes	(a) Updating. Deletes the time limit. Replaces the national response team with the "National Response Team for Oil and Hazardous Substances". Does not discuss developing and updating a curriculum, only discusses updating a curriculum. The section allowing the Secretary to consult various people in developing the curriculum is deleted. (b) replaces developed with maintained (b)(1)(A)&(B) In addition to training employees to respond to an accident or incident involving the transportation of hazardous material, they should also be trained in responding to accidents or incidents involving an alternative fuel vehicle (b)(1)(C) Instead of discussing programs developed under other U.S. government grant programs, including superfund, replaces this with programs developed with Federal Financial Assistance.	Updates (a) by: (1) deleting "November 16, 1992' (2) requiring the Secretary to "maintain," rather than "develop and update," a current curriculum (3) deleting requirement that the Secretary develop the curriculum in consultation with regional response teams and others In (b), makes changes for consistency with (a), and simplifies language in (b)(1)(C)
(§5115 cont'd) (c) Training on complying with legal requirements. (3) The course under this section shall provide the training necessary for public sector employees to comply with standards related to emergency response training. (d) Distribution and Publication Discusses working with national response team (1) the Director of FEMA shall distribute the curriculum and its updates (2) "the Secretary of Transportation may publish a list of programs that uses a course developed under this section for training public sector employees to respond to an accident or incident involving the transportation of hazardous material."	(§5115 cont'd) (d) Discusses working with the national response team (1) This section is deleted (2) changes "uses" to "use"	(§5115 cont'd) (c) Replaces National Fire Protection Association with "such voluntary consensus standard-setting organizations as the Secretary deems appropriate." (d) Replaces national response team with "the National Response Team for Oil and Hazardous Substances (1) This section is deleted (2) changes "uses" to "use" deletes "the transportation of" replaces "an accident or incident" with "accidents or incidents"	(§5115 cont'd) In (c)(3), adds standards of "other voluntary consensus standard-setting organizations" to those standards for which training must be provided Revises (d) by: (1) deleting reference to FEMA's distribution of the curriculum to regional response teams (2) giving the Secretary the authority to publish and distribute, with the National Response Team, a list of courses developed under this section and a list of programs using the courses
§5116. Planning and training grants, monitoring and review. (e) Government's share of costs. Last sentence starts with "Amounts of the State or tribe under subsections (a)(2)(A) and (b)(2)(A)..." (f) Monitoring and technical assistance. "In coordination with the Secretaries of Transportation and Energy, Administrator of the EPA, and Director of the National Institute of Environmental Health Sciences, the Director of the FEMA shall monitor public sector emergency response planning and training for an accident or incident involving hazardous material. Considering the results of the monitoring, the Secretaries, Administrator, and Directors each shall provide technical assistance to a State, political subdivision of a State, or Indian tribe for carrying out emergency response training and planning for an accident or incident involving hazardous material and shall coordinate the assistance using the existing coordinating mechanisms of the national response team and, for radioactive material, the Federal Radiological Preparedness Coordinating Committee."	No changes (e) Replaces "of" with "received by" (f) Replaces all the Secretaries, Administrator and Directors that are listed with the Secretary of Transportation. Replaces national response team with "National Response Team for Oil and Hazardous Substances"	Replaces "monitoring and review" in title with "emergency preparedness fund" (e) Replaces "of" with "received by" Deletes "(a)(2)(A) and (b)(2)(A)" and inserts "(a)(2) and (b)(2)" (f) Replaces all the Secretaries, Administrator and Directors that are listed with the Secretary of Transportation. Replaces national response team with "National Response Team for Oil and Hazardous Substances"	Revises title by deleting " monitoring, and review" and adding "emergency response preparedness fund" Revises (e) to clarify that amounts referenced are those "received by" a State or tribe In (f), deletes reference to the Secretary of Energy, the Administrator of EPA, the Director of the National Institute of Environmental Health Sciences, and the Director of FEMA, and clarifies that the Secretary alone shall monitor public-sector emergency response planning and training for an accident/incident involving hazmat

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
(§5116 cont'd) §5116(g) Delegation of authority. "To minimize administrative costs and to coordinate Government grant programs..."	(§5116 cont'd) No changes	(§5116 cont'd) (g) Replaces "government grant" with "Federal financial assistance"	(§5116 cont'd) Revises (g) for clarity
(i) Annual Registration Fee Account and its uses "The Secretary of Treasury shall establish an account in the Treasury into which the Secretary of the Treasury shall deposit amounts the Secretary of Transportation collects under section 5108(g)(2)(A) of this title and transfers to the Secretary of the Treasury under section 5108(g)(2)(C) of this title..." The amounts are available, among other things, "to pay administrative costs of carrying out this section and sections 5108(g)(2) and 5115 of this title, except that not more than 10% of the amounts made available from the account in a fiscal year may be used to pay these costs."	No changes	(i) Part of section deleted and replaced with "Emergency Preparedness Fund. -- The Secretary of the Treasury shall establish an Emergency Preparedness Fund account in the Treasury into which the Secretary of the Treasury shall deposit amounts the Secretary of Transportation transfers to the Secretary of the Treasury under section 5108(g)(2)(C) of this title..." The amounts are available "to pay administrative costs of carrying out this section and sections 5108(g)(2) and 5115 of this title, except that not more than 10% of the amounts made available from the account in a fiscal year to carry out these sections may be used to pay those costs." In addition, the amounts are available "to publish and distribute the North American Emergency Response Guidebook"	Revises (i) to establish an Emergency Preparedness Fund to fund certain activities, including publication and distribution of the Emergency Response Guidebook
(k) Reports	Adds a new subsection (l) on small businesses	(k) Deletes the section on Reports and adds a new subsection on small business	Deletes (k)
§5117. Exemptions and Exclusions "(a)(1) As provided under procedures prescribed by regulation, the Secretary of Transportation may issue an exemption from this chapter..."	Retitled "Special Permits and exclusions" Every time "exemptions" appears, the bill replaces it with "special permits" "(a)(1) As provided under procedures prescribed by regulation, the Secretary of Transportation may issue a special permit authorizing variances from this chapter..."	Same changes as 1997 Administration Bill	The section is retitled "Special permits and exclusions" Replaces "exemption" with "special approval" throughout the section (a)(1) states that the Secretary may modify or terminate, as well as issue, special permits to persons performing functions under section 5103(b)(1).
§5118. Inspectors	No changes	No changes	Deletes this section
§5119. Uniform forms and procedures (a) Working Group. "....The purposes of the working group are -- (1) to establish uniform forms and procedures for a State – (A) to register persons that transport or cause to be transported hazardous material by motor vehicle in the State."	No changes	(a)(1)(A) After register adds "and issue permits to"	Revises (a)(1) to allow the Secretary to issue regulations to establish uniform forms and procedures for a state to register and issue permits to persons transporting hazmat or causing hazmat to be transported in motor vehicles in the state or allowing hazmat transportation in the state Revises (a)(2) to prohibit the Secretary from establishing a limit on state registration fees
(c) Regulations on recommendations		(c) Adds a fourth recommendation – "Pending promulgation of regulations under this subsection, States may participate in a program of uniform forms and procedures recommended by the working group under subsection (b)."	Revises (b) to: (1) establish a one-year effective date for regulations prescribed by the Secretary under this section (2) permit an extension for good cause (3)limit state requirements to those that are the same as the Federal requirements Deletes existing (c) and proposes a new (c) that requires the Secretary to develop procedures for eliminating differences in how states carry out a regulation prescribed by the Secretary under this section
(d) Relationship to Other Laws.			Deletes existing (d) and proposes a new (d) that permits states to participate in a program of uniform forms and procedures pending the issuance of regulations under this section

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5120. International uniformity of standards and requirements	No changes	No changes	No changes
§5121. Administrative (a) General authority (b) Records, report, and information (c) Inspection (e) Report "The report shall include...."	Deletes subsections (a), (b) and (c) No changes Adds a section "(c) Authority for Cooperative Agreements – To carry out this chapter, the Secretary may enter into grants, cooperative agreements, and other transactions with a person, agency or instrumentality of the United States, a unit of State or local government, an Indian tribe, a foreign government (in coordination with the State Department), an educational institution, or other entity to further the objectives of this chapter. The objectives of this chapter include the conduct of research, development, demonstration, risk assessment, emergency response planning and training activities."	Deletes subsections (a), (b) and (c) Renumbered as 5121(b) and after "The report shall include" adds "or make appropriate reference to..." Changes are the same as the 1997 Administration Bill except (1) Changes heading to "Authority for Grants, Cooperative Agreements and Other Transactions" and (2) the "State Department" is replaced with the "Department of State"	Amends (a) to: (1) clarify that the Secretary may conduct tests (2) except inspections, investigations, and emergency orders, from prior notice and hearing requirements Amends (b) to clarify persons subject to Federal hazmat law must maintain property, if so directed by regulation or order of the Secretary, and make it available for inspection upon request Amends (c) to: (1) clarify that DOT inspectors may: (i) open and examine a package (except a package immediately adjacent to hazmat contents) if there is an "objectively reasonable and articulable belief" that it may contain a hazmat (ii) remove a package from transportation if there is a "reasonable and articulable belief "that it poses an imminent hazard (iii) gather information to determine the nature of the hazmat (iv) order the package to be transported to an appropriate facility for analysis (v) when safety may be compromised, authorize qualified personnel to assist in these activities (2) direct the Secretary to develop procedures for assisting in the safe resumption of transportation if an imminent hazard is found not to exist Redesignates existing (d) as (f), and proposes a new (d) giving the Secretary emergency order authority to respond to imminent hazards. New (d) allows the Secretary to issue/impose emergency restrictions, prohibitions, recalls, or out-of-service orders, without notice and hearing. An opportunity for review is available if a petition is filed within 20 days. Out-of -service order is defined as a mandate that a hazmat not be moved until certain conditions
§(5121cont'd)			(§5121 cont'd) Strikes existing (e) and proposes new (e) requiring the Secretary to issue regulations to implement this authority Proposes a new (g) giving the Secretary the authority to enter into grants, cooperative agreements, and other transactions to further the objectives of Federal hazmat law. Defines the objectives to include research, development, demonstration, risk assessment, and emergency response planning and training
§5122. Enforcement (a) General. "At the request of the Secretary of Transportation..." (b) Imminent hazards. Secretary may bring a civil action "to eliminate or ameliorate the hazard." (b)(2) On request of the Secretary, the Attorney General shall bring an action under paragraph (1) of this subsection." (c) "Withholding of clearance. (1) If any owner, operator, or individual in charge of a vessel is liable for a civil penalty under section 5123 of this title or for a fine under section 5124 of this title, or if reasonable cause exists to believe that such owner, operator, or individual in charge may be subject to such civil penalty or fine, the Secretary of the Treasury, upon the request of the Secretary, ... (2) Clearance refused or revoked under this subsection may be granted upon the filing of a bond or other surety satisfactory to the Secretary."	(a) moved to section (f). No other changes (b) moved to section (g). No other changes (c) not included	(a) moved to section (f). Renamed as 'Enforcement by the Attorney General" Deletes "of Transportation" (b) moved to section (g). Substitutes "mitigate" for "ameliorate" Deletes (b)(2) (c) moved to section (h) and changes wording -- "(1)If an owner... or if reasonable cause exists to believe that the owner, operator, or individual in charge may be subject to penalty or fine, the Secretary of the Treasury, upon request of the Secretary of Transportation...." (2)...satisfactory to the Secretary of the Treasury."	Revises (a) to clarify that a court may award a temporary or permanent injunction, punitive damages, and civil penalties in accordance with the criteria in 5123 Substitutes "mitigate" for "ameliorate" in (b)

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
(§5122 cont'd)	(§5122 cont'd) "(a) GENERAL AUTHORITY.--To carry out this chapter, the Secretary of Transportation may inspect, investigate, make reports, issue subpoenas, conduct hearings, require the production of records and property, take depositions, and conduct research, development, demonstration, and training activities. Except as provided in subsection (e) of this section, the Secretary shall provide notice and an opportunity for a hearing prior to issuing an order requiring compliance with this chapter or a regulation, order, special permit, or approval issued under this chapter." "(b) RECORDS, REPORTS, AND INFORMATION.—A person subject to this chapter shall– (1) maintain records, make reports, and provide information the Secretary by regulation or order requires, and (2) make the records, reports, and information available when the Secretary requests." "(c) Inspection - (1) The Secretary may authorize an officer, employee, or agent to inspect, at a reasonable time and in a reasonable way, records and property related to -	(§5122 cont'd) Same changes as 1997 Administration Law but the word "inspect" is not included replaces "subsection (e)" with "subsection (d) Replaces "requiring" with "directing" The section is entitled "Records, Reports, Property, and Information" (1) adds language "information that the Secretary..." (2) adds language "reports, property and information available for inspection when the Secretary requests." "(c) INSPECTIONS AND INVESTIGATIONS.-- (1) A designated officer or employee of the Secretary may– (A) inspect and investigate, at a reasonable time and in a reasonable way, records and property related to– (I) designing, manufacturing, fabricating, marking, maintaining, reconditioning, repairing, inspecting, (B) except for the packaging immediately adjacent to its hazardous material contents, open and examine a package offered for, or in, transportation when the officer or employee has an objectively reasonable and articulable belief that the package may contain a hazardous material;	
(§5122 cont'd)	(§5122 cont'd) (A) manufacturing, fabricating, marking, maintaining, reconditioning, repairing, testing, or distributing a packaging or a container for use by a person in transporting hazardous material in commerce; or (B) the transportation of hazardous material in commerce. (2) an officer, employee, or agent under this subsections shall display proper credentials when requested."	(§5122 cont'd) (C) remove from transportation a package or related packages in a shipment offered for or in transportation, and for which such officer or employee has an objectively reasonable and articulable belief that the package or packages may pose an imminent hazard, and for which the officer or employee contemporaneously documents that belief in accordance with procedures adopted under subsection (e) of this section; (D) gather information from the offeror, packaging manufacturer or retester, or other person responsible for the package to ascertain the nature and hazards of the contents of the package;" (2) An officer or employee acting under this subsection shall display proper credentials when requested. (3) For instances when, as a result of the inspection or investigation, an imminent hazard is not found to exist, the Secretary shall develop procedures to assist in the safe resumption of transportation of the package and transport unit.	

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
(§5122 cont'd)	(§5122 cont'd) (d) Other authority - During inspections and investigations, officers, employees, or agents of the Secretary may – (1) open and examine the contents of a package offered for, or in transportation when – (A) the package is marked, labeled, certified, placarded, or otherwise represented as containing a hazardous material, or (B) there is an objectively reasonable and articulable belief that the package may contain a hazardous material; (2) take a sample, sufficient for analysis, of material marked or represented as a hazardous material or for which there is an objectively reasonable and articulable belief that the material may be hazardous material, and analyze that material; (3) when there is an objectively reasonable and articulable belief that an imminent hazard may exist, prevent the further transportation of the material until the hazardous qualities of the material have been determined, and (4) when safety might otherwise be compromised, authorize properly qualified personnel to conduct the examination, sampling, or analysis of a material."	(§5122 cont'd) " (E) as necessary, under terms and conditions specified by the Secretary, order the offeror, packaging manufacturer or retester, or other person responsible for the package to have the package transported to, opened and the contents examined and analyzed at a facility appropriate for the conduct of this activity; and (F) when safety might otherwise be compromised, authorize properly qualified personnel to assist in the activities conducted under subsection (c)(1)(B) of this section. (2) An officer or employee acting under this subsection shall display proper credentials when requested. (3) For instances when, as a result of the inspection or investigation, an imminent hazard is not found to exist, the Secretary shall develop procedures to assist in the safe resumption of transportation of the package and transport unit."	
(§5122 cont'd)	"(e) EMERGENCY ORDERS.--(1) If, through testing, inspection, investigation, or research carried out under this chapter, the Secretary decides that an unsafe condition or practice, or a combination of them, causes an emergency situation involving a hazard of death, personal injury, or significant harm to the environment, the Secretary may immediately issue or impose restrictions, prohibitions, recalls or out-of-service orders, without notice or the opportunity for a hearing, that may be necessary to abate the situation. (2) The Secretary's action under this subsection must be in a written order describing the condition or practice, or combination of them, that causes the emergency situation; stating the restrictions, prohibitions, recalls, or out-of-service orders being issued or imposed; and prescribing standards and procedures for obtaining relief from the order. (3) After taking action under this subsection, the Secretary shall provide an opportunity for review of that action under section 554 of title 5. (4) If a petition for review is filed and the review is not completed by the end of the 30-day period beginning on the date the petition was filed, the action will cease	"(d) EMERGENCY ORDERS.--(1) If, upon inspection or investigation, the Secretary determines that either a violation of a provision of this chapter or a regulation issued under this chapter, or an unsafe condition or practice, is causing an imminent hazard, the Secretary may issue or impose emergency restrictions, prohibitions, recalls, or out-of-service orders, without notice or the opportunity for a hearing, but only to the extent necessary to abate the imminent hazard. (2) The Secretary's action under subsection (d)(1) must be in a written order describing the violation, condition or practice that is causing the imminent hazard, and stating the restrictions, prohibitions, recalls, or out-of-service orders issued or imposed. The order also shall describe the standards and procedures for obtaining relief from the emergency order. (3) After taking action under subsection (d)(1), the Secretary shall provide an opportunity for review of that action under section 554 of title 5, and such review shall occur no later than 20 days after issuance of such order."	

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
(§5122 cont'd)	(§5122 cont'd.) to be effective at the end of that period unless the Secretary determines in writing that the emergency situation still exists."	(§5122 cont'd) "(e) REGULATIONS.—The Secretary shall issue regulations with notice and comment, including an opportunity for informal hearing, to implement the authority in subsections (c) and (d) of this section."	
§5123. Civil Penalty "(a) Penalty. (1) A person that knowingly violates this chapter or a regulation prescribed or order issued under this chapter is liable to the U.S. Government for a civil penalty of at least $250 but not more than $25,000 for each violation..." (c) Penalty Considerations "(2) with respect to the violator, the degree of culpability, any history of prior violations, the ability to pay, and any effect on the ability to continue to do business..."	(a) Changes words: "(1) A person that knowingly violates this chapter or a regulation, order, special permit, or approval issued under this chapter is liable to the U.S. Government for a civil penalty of at least $250 but not more than $27,500 for each violation..." (c) adds language "(2) with respect to the violator, the degree of culpability, any good faith efforts to comply with the applicable requirements, any history of prior violations, any economic benefit resulting from the violation, the ability to pay, and any effect on the ability to continue to do business..."	(a) Same changes as 1997 Administration Bill (c) Same changes as 1997 Administration Bill	Revises (a) to clarify that violations of special permits and approvals, as well as regulations and Federal hazmat law, can subject a person to a civil penalty. The civil penalty ceiling, per violation, is revised from $25,000 to $100,000. Also revises (a) to state that knowledge of the existence of a statutory or regulatory requirement is not an element of an offense under this section Redesignates (b)-(g) as (c)-(h), and adds a new (b) setting out the definition of a "knowing" violation currently found in (a) Revises (c), as redesignated, to clarify that notice and an opportunity for hearing must precede a finding that a person has violated an order, special permit, or approval, as well as a regulation or provision of Federal hazmat law Revises (d), as redesignated, to clarify that in a civil action to collect a civil penalty, the government may also seek to collect accrued interest
§5124. Criminal Penalty "A person knowingly violating section 5104(b) of this title or willfully violating this chapter or a regulation prescribed or order issued under this chapter shall be fined under title 18, imprisoned for not more than 5 years, or both."	Adds language – "(a) General. - A person knowingly violating section 5104(b) of this title or willfully violating this chapter or a regulation, order, special permit, or approval issued under this chapter, shall be fined under title 18, imprisoned for not more than 5 years or both." Also adds an entire subsection, (b), on Aggravating Violations	Same changes as 1997 Administration Bill. However, adds at the end of section (a) "...Knowledge by the person of the existence of a regulation or requirement prescribed by the Secretary is not an element of an offense under this section."	Revises (a) to clarify that willful violations of Federal hazmat law, or regulations, orders, special permits, or approvals issued under Federal hazmat law, will be fined under title 18, imprisoned for not more than 5 years, or both Adds a new (b) stating that a violation of this section which causes a release of hazardous materials is an aggravated violation subject to fines under title 18, 20 years imprisonment, or both Adds a new (c) defining "knowing violations" as "when (1) a person has actual knowledge of the facts giving rise to the violation; or (2) when a reasonable person acting in the circumstances and exercising reasonable care would have that knowledge." Adds a new (d) defining willful violations as those done with intent Adds a new (e) stating that knowledge of the existence of a statutory or regulatory requirements is not an element of an offense under this section [Section 21 of the Administration bill also amends 49 U.S.C. 46312 to clarify that the regulations referred to in that section also include the HMR.]

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5125. Preemption "(a)(2) the requirement of the State, political subdivision, or tribe, as applied or enforced, is an obstacle to accomplishing and carrying out this chapter, or a regulation prescribed under this chapter." (b)(2). "...The Secretary shall decide on and publish in the Federal Register the effective date of section 5103(b) of this title for any regulation or standard about any of those subjects that the Secretary prescribes after November 16, 1990..." (h) This section not included	(a)(2) No changes (b)(2) Deletes "after November 16, 1990" (h) This section not included	(a)(2) Adds language - "...carrying out this chapter, the purposes of this chapter, or a regulation prescribed under this chapter." (b)(2) Same change as 1997 Administration bill. Adds "(h) Independent Application of Each Standard"	Redesignates (a)-(c) as (b)-(d), and adds a new (a) stating that the purpose of 5125 is to achieve uniform regulation of hazmat transportation, eliminate inconsistent non-federal rules, and promote safe and efficient movement of hazmat in commerce Revises (b), as redesignated, to add an assessment of whether a non-federal requirement is an obstacle to the purposes of Federal hazmat law Revises (c), as redesignated, to add the inspection of a packaging or packaging component to the list of covered subjects and to strike "November 16, 1990" Deletes (f), and redesignates (g), (d), and (e) as (e), (f), and (g) In (f), as redesignated, clarifies that a person may seek a preemption determination under 5119(b) as well as under 5125, and continues to require the Secretary to notify the public of delays in issuing preemption determinations but deletes Federal Register notice Revises (g), as redesignated, to clarify that a person may seek a preemption waiver under the provisions of 5119(b), as well as under 5125 Adds a new (h) to clarify that preemption standards in 5119 and 5125 apply independently Adds a new (i) stating that 5125 does not apply to non-federal enforcement procedure, penalties, or mental state requirements
§5126. Relationship to other laws	No changes	No changes	In (a), clarifies that persons under contract to the U.S. that cause hazmat to be transported, or that inspect packagings or packaging components are subject to Federal hazmat law and the HMR In (b), excludes marine transportation of hazmat regulated under title 33 or 46 from regulation under Federal hazmat law

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5127. Authorization of appropriations. (Moved to and Renumbered as §5128 in 1997 Administration Bill and as §5129 in 1999 Administration Bill. See below for text of current §5127)	Adds new 5127 as follows: §5127. Judicial Review "(a). Filing and Venue.-Except as provided in section 20114(c) of this title, a person disclosing a substantial interest in a final order issued, under the authority of section 5122 or 5123 of this title, by the Secretary of Transportation, the Administrators of the RSPA, the FAA, or the FHWA, or the Commandant of the US Coast Guard ("modal administrator") with respect to the duties and powers designated to be carried out by the Secretary under this chapter, may apply for review in the United States Court of Appeals for the District of Columbia or in the court of appeals for the United States for the circuit in which the person resides or has its principal place of business. The petition must be filed not more than 60 days after the order is issued. The court may allow the petition to be filed after the 60th day only if there are reasonable grounds for not filing by the 60th day. (b) Judicial Procedure -When a petition is filed under subsection (a) of this section, the clerk of the court immediately shall send a copy of the petition to the Secretary or the modal Administrator, as appropriate. The Secretary or the modal Administrator shall file with the court a record of any proceeding in which the order was issued, as	Adds new 5127 as follows: §5127. Judicial Review Same changes as 1997 Administration Bill Deletes all references to "the Administrators of the RSPA, the FAA, or the FHWA, or the Commandant of the United States Coast Guard ("modal administrator")" and deletes all references to the modal Administrator In (a) adds words "... of the order..." after "...may apply for review"... Adds at the very end of (b) "..., United States Code"	Redesignates 5127 as 5128, and adds a new 5127 as follows: § 5127. Judicial Review. (a) provides that any person suffering legal wrong or adversely affected or aggrieved by a final action of the Secretary may petition for review in the U.S. Ct. of Appeals for D.C. or in the appropriate court of appeals within 60 days of the Secretary's action becoming final (b) Same as 1999 Administration bill
	(§5127 cont'd) (c) AUTHORITY OF COURT.--When the petition is sent to the Secretary or the modal Administrator, the court has exclusive jurisdiction to affirm, amend, modify, or set aside any part of the order and may order the Secretary or the modal Administrator to conduct further proceedings. After reasonable notice to the Secretary or the modal Administrator, the court may grant interim relief by staying the order or taking other appropriate action when good cause for its action exists. Findings of fact by the Secretary or the modal Administrator, if supported by substantial evidence, are conclusive. (d) REQUIREMENT FOR PRIOR OBJECTION.--In reviewing a final order under this section, the court may consider an objection to a final order of the Secretary or the modal Administrator only if the objection was made in the course of a proceeding or review conducted by the Secretary or if there was a reasonable ground for not making the objection in the proceeding. (e) SUPREME COURT REVIEW.--A decision by a court under this section may be reviewed only by the Supreme Court under section 1254 of title 28, United States Code.	(§5127 cont'd) (c) Deletes "After reasonable notice to the Secretary or the modal Administrator, the court may grant interim relief by staying the order or taking other appropriate action when good cause for its action exists." (d) & (e) Unchanged from 1997 Administration bill except references to "or the modal Administrator" are deleted	(§5127 cont'd) Provides in (c) that: (1) a court has exclusive jurisdiction, under the Administrative Procedure Act, to affirm, amend, modify, or set aside any part of the Secretary's final action or may order additional proceedings (2) Findings of fact are conclusive if supported by substantial evidence (d) is the same as in the 1999 Administration bill except "final order" is changed to "final action" throughout (d)

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
§5127. Authorization of appropriations "(a) General. Not more than $18,000,000 may be appropriated to the Secretary of Transportation for fiscal year 1993, $18,000,000 for fiscal year 1994, $18,540,000 for fiscal year 1995, $19,100,000 for fiscal year 1996, and $19,670,000 for fiscal year 1997 to carry out this chapter (except sections 5107(e), 5108(g)(2), 5113, 5115, 5116, and 5119)." (b) Training of hazmat employee instructors (1) There is authorized to be appropriated to the Secretary, $ 3,000,000 for each of fiscal years 1995, 1996, 1997, and 1998 to carry out section 5107(e). (2) (A) There shall be available to the Secretary for carrying out section 5116(j), from amounts in the account established pursuant to section 5116(i), $250,000 for each of fiscal years 1995, 1996, 1997, and 1998. (B) In addition to amounts made available under subparagraph (A), there is authorized to be appropriated to the Secretary, for carrying out section 5116(j) $ 1,000,000 for each of the fiscal years 1995, 1996, 1997, and 1998.	§5128. Authorization of Appropriations Deletes first reference to $18,000,000 and replaces with $15,492,000 Deletes "1993...fiscal year 1997" and inserts "1998, and such sums as may be necessary for fiscal year s 1999, 2000, 2001, 2001, and 2003," Section (b) not included in 1997 Administration Bill (?)	§5129. Authorization of appropriations Inserts after (a) General. "To carry out this chapter [49 USCS §§ 5101 et seq.] (except sections 5107(e), 5108(g), 5109, 5112, 5113, 5115, 5116, 5119, and 5128), (1)" Deletes first reference to "18,000,000" and inserts "13,638,000 is authorized to" Deletes "1993...and 5119" and inserts "2000, and, (2) from amounts collected under section 5108(g)(2)(B)(ii) of this title, not more than $18,213,000 is authorized to be appropriated to the Secretary for fiscal year 2000, and such sums as may be necessary are authorized to be appropriated for fiscal years 2001 through 2005." Retitled (b) as "Supplemental Training Grants" Deletes (1) and 2(B). (2) (A) Deletes "There shall be available to the Secretary for carrying out section 5116(j)" and inserts "Not more than $250,000 is available to the Secretary for fiscal year 2000 and such amounts as are necessary for fiscal years 2001 through 2005" Deletes "pursuant to" and inserts "under" After "5116(i)" inserts "of this title," Deletes "$ 250,000 for each of fiscal years 1995, 1996, 1997, and 1998" and inserts "to carry out section 5116(j) of this title".	§5128 Authorization of Appropriations Revises (a) to authorize not more than $21,217,000 for FY 2002 to carry out Federal hazmat law (except 5107(e), 5108(g), 5112, 5113, 5115, 5116, and 5119) and such sums as may be necessary for FY 2003-2007 Deletes existing (b)-(e) and inserts a new (b) creating an emergency preparedness fund, authorizing: (1)$250,000 to carry out 5116(j) (supplemental training grants) (2) $200,000 to carry out 5115 (public sector training curriculum) (3)$5,000,000 to carry out 5116(a) (planning grants) (4)$7,800,000 to carry out 5116(b) (training grants) (5)$150,000 to carry out 5116(f) (monitoring and technical assistance) (6)$500,000 to publish the Emergency Response Guidebook (7)such amounts as may be necessary to carry out 5107(e) (training grants) (8)$400,000 to carry out 5116(i)(4) (administrative costs) Redesignates (f) as (c) Redesignates (g) as (d)
(§5127 cont'd) §5127(c) Training Curriculum--(1) Not more than $1,000,000 is available to the Secretary of Transportation from the account established under section 5116(i) of this title for each of the fiscal years ending September 30, 1993-1998, to carry out section 5115 of this title. (2) The Secretary of Transportation may transfer to the Director of the Federal Emergency Management Agency from amounts available under this subsection amounts necessary to carry out section 5115(d)(1) of this title. (d) Planning and training --(1) Not more than $5,000,000 is available to the Secretary of Transportation from the account established under section 5116(I) of this title for each of the fiscal years ending September 30, 1993-1998, to carry out section 5116(a) of this title. (2) Not more than $7,800,000 is available to the Secretary of Transportation from the account established under section 5116(I) of this title for each of the fiscal years ending September 30, 1993-1998, to carry out section 5116(b) of this title (3) Not more than the following amounts are available from the account established under section 5116(I) of this title for each of the fiscal years ending September 30, 1993-1998, to carry out section 5116(f) of this title: (A) $750,000 each to the Secretaries of Transportation and Energy, Administrator of the Environmental Protection Agency, and Director of the Federal Emergency Management Agency. (B) $200,000 to the Director of the National Institute of Environmental Health Sciences. (e) Uniform forms and Procedures	(§5128 cont'd) Deletes "$1,000,000" and inserts "$200,000" Deletes "1993-1998" and inserts "1999-2003" Deletes subsection (2) (1) Deletes "$5,000,000" and inserts "$2,444,000" Deletes "for each of the fiscal years ending September 30, 1993-1998" and inserts "for the fiscal year ending September 30, 1998, and such sums as may be necessary for the fiscal years 1999-2003," Replaces "5116(a)" with "5115" (2) Deletes "$7,800,000" and inserts "3,666,000" Deletes "each of the fiscal years ending September 30, 1993-1998" and inserts "the fiscal year ending September 30, 1998, and such sums as may be necessary for fiscal years 1999-2003" (3) Deletes "the following amounts are" and inserts "$600,000 is " After "available" inserts "Secretary of Transportation" Deletes "each of the fiscal years ending September 30, 1993-1998" and inserts "the fiscal year ending September 30, 1998, and such sums as may be necessary for fiscal years 1999-2003" Deletes subsections (A) & (B) Deletes (e)	(§5129 cont'd) (c) Training curriculum. --Deletes "$1,000,000" and inserts "$200,000" After "Secretary" deletes "of Transportation" and inserts "for fiscal year 2000 and such amounts as are necessary for fiscal years 2001- 2005" Between "from" and "account" inserts "amounts in" Deletes "for each of the fiscal years ending September 30, 1993-1998" Deletes (c)(2) (1) Deletes "of Transportation" and inserts "for fiscal year 2000 and such amounts as are necessary for fiscal years 2001 through 2005" Inserts "amounts in" between "from" and "the account" Deletes "for each of the fiscal years ending September 30, 1993-1998" (2) Deletes "of Transportation" and inserts "for fiscal year 2000 and such amounts as are necessary for fiscal years 2001 through 2005" Inserts "amounts in" between "from" and "the account" Deletes "for each of the fiscal years ending September 30, 1993-1998" (3) Deletes "the following amounts are" and inserts "$150,000 is" After "available" inserts "to the Secretary for fiscal year 2000 and such amounts as are necessary for fiscal years 2001 through 2005" Inserts "amounts in" between "from" and "the account" Deletes "for each of the fiscal years ending September 30, 1993-1998" Deletes subsections (A) & (B) Deletes current (e) and adds "(e) EMERGENCY RESPONSE GUIDEBOOK."	

Current Law	1997 Administration Bill	1999 Administration Bill	2001 Administration Bill
(§5127 cont'd) (f) Credits to appropriations. The Secretary of Transportation may credit to any appropriation to carry out this chapter [49 USCS §§ 5101 et seq.] an amount received from a State, Indian tribe, or other public authority or private entity for expenses the Secretary incurs in providing training to the State, authority, or entity. (g) Availability of amounts. Amounts available under subsections (c)-(e) of this section remain available until expended.	(§5128 cont'd) Subsection (f) not included(?) Current (g) moved to (f). Deletes "(c)-(e)" and inserts "(c) and (d)" Adds a section for a "Hazardous materials Pilot Program"	(§5129 cont'd) (f) moved to paragraph (h). No changes from current law (g) moved to paragraph (i). Deletes "subsections (c)-(e) of" Adds §5129(f) Administration Costs Adds §5129(g) Training of Hazmat Employee Instructors Adds §5128. High-risk hazardous material; motor carrier safety study Adds Sec. 19. "Intermodal Container Pilot Program."	
			SEC. 26 POSTAL SERVICE CIVIL PENALTY AUTHORITY Proposes to amend U.S. Postal Service authority to provide USPS with the necessary authority to effectively regulate hazardous materials in the mail through meaningful enforcement of its regulations. The proposed civil penalty provisions mirror the civil penalty provisions for Federal hazmat law.

APPENDIX C

Interview Summaries and Background Data

Interview Questions:

Six interview questions were devised and intended to illicit responses to help answer specific investigative questions (IQs) outlined in chapter 1. Question 1 is almost verbatim from IQ 2 and seeks to update information that was unable to be gleaned from the review of other available sources. Question 2 follows up and asks specifically if any new legislation is either on the books or in the works. Question 3 speaks to IQ 1 and looks to extend past regulation with any feelings that state officials may have regarding new or future hazmat legislation. Questions 4 and 5 are similar but ask questions from two different angles. Both interview questions address IQs 4 and 5 and add important primary data necessary for answering these complex questions. Since all states selected for interviews are members of the "Alliance" (Alliance for Uniform Transportation Procedures), the intent of these questions are to figure out if these seven states are still actively cooperating as an alliance and new initiatives are still being created and shared. Question 5 is asking interviewed states about cooperation with other states outside of the Alliance. For example, since Ohio and Kentucky border each other are there any hazmat legislation that streamlines the border crossing process between these states? Finally, question 6 seeks to ascertain each state's biggest challenge(s) to federal compliance. Although question 6 does not address any specific IQ, it was one of the questions asked in the Battelle compliance study and is an interesting capstone to answering the overall research question.

1. Have the events of September 11th, 2001 changed the way hazardous materials are routed or regulated in your state? If so, do you have any specific examples?
2. Is there any new hazmat legislation implemented or proposed at the state level that you are aware of?
3. What do you think future hazmat regulations at the Federal level will look like? Do you feel states will have more or less rights based upon pivotal legislation such as HM-223?
4. As a member state of the Alliance for Uniform Transportation Procedures, what initiatives has your state instituted to streamline the hazmat registration process (i.e., forms, procedures, adopting best practices, etc). Why do you think only seven states have joined the alliance and do you know of any other states that are interested in joining?
5. Has your state worked with any other states outside of the Alliance in creating hazmat legislation for simplifying the regulations from state-to-state?
6. What do you consider to be your top regulatory compliance issue for hazmat transportation in your state (i.e. roadside inspections, training & outreach, permitting, registration, routing, enforcement, or program resources)?

Interview Responses by State:

Illinois:

Question 1: No new routes or regulations have resulted from 9/11 in Illinois. Many of the initiatives in place before 9/11 were strengthened or

reviewed and more vigilance was placed upon the hazmat routes and enforcement but nothing has been changed or altered regarding specific routes or regulations.

Question 2: No new legislation at the state level in Illinois has been implemented or proposed. Illinois works closely with the other Alliance states to keep consistent legislation with those states and to comply with the Federal regulations.

Question 3: The state official declined to comment and deferred the question to the Illinois Motor Carrier Division which is part of the Highway Patrol.

Question 4: Illinois works with the other six member states in adopting new initiatives. The state official mentioned electronic forms and open lines of communication between Alliance member states as ways they streamline the registration and legislation aspects of the program for shippers and carriers. Missouri was identified as a state that will be joining the Alliance very soon. This will bring the total number of member states to eight but still well short of the number the FMCSA initially proposed in order to make the program mandatory for all states.

Question 5: Illinois has not worked with either neighboring or other non-bordering states in establishing streamlined hazmat legislation.

Question 6: The state official from Illinois cited enforcement and outreach as the main obstacles to compliance in the state of Illinois.

Michigan:

Question 1: The main thing that has changed for Michigan's hazmat program since 9/11 has been the attention given to hazmat carrier's credentials within the state. Homeland security regulations have forced states to pay closer attention to transporters of these materials. In particular, certain subsets of hazmat like radioactive waste and other bulk items or shipments of hazardous materials have increased scrutiny placed upon them by the federal mandates. Michigan has three border crossings in the Detroit metro area and managing those entry points has been a major challenge for state hazmat officials since 9/11. No new regulations specifically resulting from September 11th have been proposed or implemented in Michigan.

Question 2: Michigan is currently re-writing their hazmat legislation to reflect changes that the Alliance is currently pursuing in becoming compliant with the new Federal guidelines. No new hazmat legislation is specifically being written for Michigan at this time.

Question 3: The state official from Michigan feels that the current trend of a more federally mandated hazmat legislation program will ultimately prevail. The momentum seems to be with the various transportation groups that lobby Washington for more streamlined hazmat guidelines and the official interviewed felt that the current trend will continue despite the efforts of the Alliance to keep both state's rights and to satisfy the hazmat industry shippers and carriers.

Question 4: Michigan has also instituted electronic forms to streamline the registration process and helped lead the way on implementing this type of communication since they joined the Alliance in 1998. Michigan also maintains

close ties with all of their other agencies that deal with hazmat materials and waste.

Question 5: Michigan has worked with Missouri and Massachusetts in the past by providing guidelines for bringing their hazmat programs closer to Alliance procedures. This was merely an exchange of information about Michigan's hazmat program and the Alliance's registration process and was not followed up with any other official correspondence.

Question 6: The main barrier to compliance in Michigan is programmatic issues such as proper shipping documents or shipping manifests that specifically deal with the hazardous waste subset of hazmat.

Final note: Michigan manages only the subset of hazardous materials referred to as hazardous waste and liquid industrial waste. Michigan does not require state mandated credentials for hazardous materials and relies on the federal guidelines for carriers to follow. The Motor Carrier Division of the Highway Patrol in Michigan enforces hazmat and conducts the safety and compliance aspects of the program for carriers who haul strictly hazmat materials. Similarly, Illinois and Oklahoma have set up state programs much like Michigan's with their respective Motor Carrier Divisions handling the hazmat realm.

Minnesota:

Question 1: The state official from Minnesota noted increased safety issues imposed by the FMCSA was basically the only impact of the 9/11 attacks

on the hazmat program in Minnesota. No new routing restrictions or changes have been made since September 11th, 2001. Many of the established guidelines for hazmat routing were already in place well before then.

Question 2: No new hazmat legislation specifically for the state of Minnesota is either in the works or proposed. The state official from Minnesota did echo what other Alliance states have mentioned about their hazmat legislation mirroring those of the Federal guidelines.

Question 3: The Minnesota state official eventually sees the Federal hazmat program superseding the current state-run programs and requiring all states to register all hazardous materials regardless of type. The state official feels that the Alliance has not garnered enough buy-in from the rest of the states in the union and even member states are sometimes questioning their membership within the Alliance when non-member states are continuing to be allowed freedom over their own programs by the government. In addition, the official feels that a federally run hazmat registration program utilizing the same registration technique currently used by the Alliance based on home state registration would probably work due to Federal backing rather than relying on state buy-in.

Question 4: Minnesota was one of the original four states that joined the Alliance in 1994. Minnesota played a key role in establishing the initial uniform forms and registration guidelines adopted by the Alliance. Since then, they have followed the initiatives created collectively through bi-annual conferences and

meetings held throughout the year with other member states. The electronic forms were mentioned as a recent addition to the streamlining process.

Note: As previously mentioned, Illinois, Michigan, and Oklahoma only require registration of hazardous waste materials while Minnesota, Nevada, Ohio, and West Virginia require registration of both hazardous waste and hazardous materials at the state level in addition to the Federal hazmat registration. This parity between hazardous waste states and the states requiring full hazardous material registration has always been a point of contention within the Alliance but since the organization depends on member states for its viability, it makes the best of the dual state-run systems.

Question 5: Minnesota has not worked specifically with any other states outside of the Alliance. Minnesota did coordinate an outreach program intended to recruit new states into the Alliance in the late 1990s but ran into resistance from many state governments who viewed that Alliance as a threat to their rights in forming hazmat rules and licensure programs.

Question 6: The state official from Minnesota said the biggest obstacle for compliance with Federal hazmat regulations was roadside inspections and subsequent audits of non-compliant companies. These two activities accounted for much of the resources devoted to the entire hazmat program within the state of Minnesota.

Nevada:

Question 1: Nevada has altered its routing procedures to exclude all hazmat carriers from transporting hazardous materials across Hoover Dam. Also the state of Nevada is looking more closely at carriers' safety records and is working in tandem with other Alliance states to coordinate efforts on that issue.

Question 2: As with other Alliance states, Nevada is in the midst of complying with new Federal safety regulations but no new state specific legislation has been enacted as a result of 9/11.

Question 3: The state official from Nevada has a very different outlook of the future Federal hazmat regulatory power than that of the state official from Minnesota. The Nevada official firmly believes that the Alliance will ultimately prevail and more states will join the Alliance therefore keeping the states rights out of the hands of the Federal government. Nevada has been in contact with Utah and Washington in the recent past and has shared information about its hazmat program and Alliance registration procedures with those states but no new action or dialogue on the part of Utah or Washington has developed.

Question 4: According to the Nevada state official, the Alliance works as a group to implement new changes to its program and these new initiatives are discussed at conferences that are held twice a year. The most recent conference was held in California in January 2006. Missouri was also invited and seeks to join the Alliance in the near future.

Question 5: Nevada has not worked on legislation with other states outside of the Alliance but the state official did reiterate the state's outreach to

Washington and Utah and expressed a willingness to cooperate with any other state with similar interests.

Question 6: The biggest challenge to Federal hazmat compliance according to the Nevada state official is getting information out to the carriers and shippers. Training is also a concern since new requirements regarding safety and security are always evolving.

Ohio:

Question 1: No specific hazmat routing or legislation has been implemented since 9/11 in the state of Ohio. All of the routing guidelines were in place prior to 9/11 and Ohio has made no changes to those routes. The state official did mention the new Federal regulations regarding the driver's background requirements. The state official pointed out that those new requirements have had an impact on the hazmat trucking industry since it does limit the pool of potential available drivers.

Question 2: No new hazmat legislation has been either proposed or implemented in Ohio.

Question 3: The state official from Ohio believes that the current trend of increased Federal involvement in directing hazmat regulations will continue and states will become completely aligned with regulations at the Federal level at some point in the future.

Question 4: Ohio has been actively involved with the most recent streamlining of the application process within the Alliance and has made several

recommendations to improve the application process itself. The Ohio state representative did note that the Alliance is a cooperative organization and Ohio doesn't take full credit for any one improvement initiative within the program. Note: The Ohio state official mentioned that one of the past initiatives of the Alliance was to collect fingerprints of several of the top officials within each of the major hazmat transportation companies in each Alliance state to assist in compliance and for audit purposes. This initiative was started in the late 1990s but was found to have little value added to the overall hazmat programs of the states so it was discontinued after two years of implementation.

Question 5: The Ohio representative mentioned Missouri as a state that had accepted an initial $20,000 grant set aside for states seeking to join the Alliance and was invited to the conference that was held in January 2006 in California. Massachusetts has a bill that has been through hearings and is now in committee to seek entrance into the Alliance. New Jersey is in the process of introducing similar legislation in February 2006. Other than those states mentioned, Ohio has not specifically worked with any other states in creating new hazmat legislation.

Question 6: Roadside inspections and compliance reviews are the biggest challenges to Federal hazmat compliance for Ohio.

Oklahoma:

Question 1: The state representative from Oklahoma cited the new Federal changes to the hazmat program since 9/11 but noted that no specific

changes to the way hazmat vehicles are routed or regulated in Oklahoma has occurred since the new Federal changes were put into place.

Question 2: A safety bill aimed at bringing certain aspects of Oklahoma's hazmat materials and hazmat waste permit programs into line with Federal regulations has passed the legislature but has not yet been implemented. The state official did not foresee the bill being implemented for a couple years.

Question 3: The state official felt that the current trend of Federal regulation would continue and states will have less rights due to pre-emption by the Federal government.

Question 4: Oklahoma played a role in creating a less complicated application for the carriers to fill out, but the state official stated that the Alliance usually works very closely in creating new ideas as a group.

Question 5: Oklahoma has not worked with any other states outside of the Alliance like Texas or other bordering states. The state official cited the reason why only seven other states (Missouri pending) have joined and only a couple other have expressed interest is the lack of information. Alliance states have a hard time convincing non-Alliance states to join due to the perceived notion that states have to give up all of their rights over their hazmat programs and follow the rules of the Alliance. What many states fail to realize is most of their programs could be improved by streamlining the process and cutting out some unnecessary paperwork and agencies.

Question 6: The state official from Oklahoma did not have a response for this question.

West Virginia:

Question 1: As far regulation is concerned, every state is now required to have a comprehensive hazmat security plan on file as per Federal regulations. No routing changes in West Virginia have resulted from September 11th. St Virginia is one of the states that utilize the National Hazardous Materials Route Registry.

Question 2: No new hazmat legislation has been implemented or proposed in West Virginia.

Question 3: The state official from West Virginia felt that the Federal government was going to continue to impose more and more rigid regulations upon the states and that the trend of pre-emption would continue.

Question 4: The biggest change for West Virginia in the last year has been streamlining the application process and eliminating paperwork with the cooperation of the other Alliance states. West Virginia has not specifically led the way in any one improvement or benchmarked its hazmat program for any of the other states, rather the Alliance states decide together on what actions the program will take.

Question 5: West Virginia has not worked with any other states outside of the Alliance regarding legislation or streamlining hazmat procedures or processes.

Question 6: Roadside inspections are the front line defense for hazmat incidents and the state official from West Virginia said much of the state's resources are placed there for the greatest safety impact.

Table 4. HMEP State Grant Dispersal FY 03 (DOT 2005)

Hazardous Materials Emergency Preparedness (HMEP) Grants Made for Use in Fiscal Year 2003*

Alabama	$236,183	New Hampshire	$106,013
Alaska	$82,560	New Jersey	$289,579
Arizona	$183,283	New Mexico	$150,123
Arkansas	$158,959	New York	$470,968
California	$964,316	North Carolina	$316,260
Colorado	$181,716	North Dakota	$137,298
Connecticut	$145,112	Ohio	$510,751
Delaware	$91,223	Oklahoma	$188,028
District of Columbia	$73,484	Oregon	$175,178
Florida	$453,407	Pennsylvania	$404,762
Georgia	$300,494	Rhode Island	$92,480
Hawaii	$88,920	South Carolina	$190,616
Idaho	$113,259	South Dakota	$126,980
Illinois	$612,982	Tennessee	$249,996
Indiana	$302,514	Texas	$668,460
Iowa	$204,938	Utah	$145,957
Kansas	$230,885	Vermont	$84,172
Kentucky	$182,148	Virginia	$243,051
Louisiana	$204,058	Washington	$206,220
Maine	$107,242	West Virginia	$140,570
Maryland	$186,902	Wisconsin	$260,053
Massachusetts	$214,283	Wyoming	$94,237
Michigan	$331,393		
Minnesota	$262,068		
Mississippi	$177,883	American Samoa	$66,207
Missouri	$266,548	Guam	$67,353
Montana	$118,746	Northern Mariana Islands	$65,973
Nebraska	$183,399	Puerto Rico	$126,417
Nevada	$123,594	US Virgin Islands	$66,984

Fallon Paiute-Shoshone Tribe, NV	$22,485
Inter Tribal Council, AZ	$160,000
Menominee Indian Tribe, WI	$19,254
Mississippi Band of Choctaw Indians, MS	$16,150
Pueblo of Acoma, NM	$26,735
Pueblo of Laguna, NM	$31,788
Pyramid Lake Paiute Tribe, NV	$43,278
Reno Sparks Indian Colony, NV	$18,923
St. Regis Mohawk Tribe, NY	$24,200
Salish & Kootenai Tribes, MT	$10,000
Grand Total	$12,799,998

Table 5. HMEP State Grant Dispersal FY 04 (DOT 2005)

Hazardous Materials Emergency Preparedness (HMEP) Grants Made for Use in Fiscal Year 2004*

Alabama	$236,183	New Hampshire	$106,013
Alaska	$82,560	New Jersey	$289,579
Arizona	$183,283	New Mexico	$150,123
Arkansas	$158,959	New York	$470,968
California	$964,316	North Carolina	$316,260
Colorado	$181,716	North Dakota	$137,298
Connecticut	$145,112	Ohio	$510,751
Delaware	$91,223	Oklahoma	$188,028
District of Columbia	$73,484	Oregon	$175,178
Florida	$453,407	Pennsylvania	$404,762
Georgia	$300,494	Rhode Island	$92,480
Hawaii	$88,920	South Carolina	$190,616
Idaho	$113,259	South Dakota	$126,980
Illinois	$612,982	Tennessee	$249,996
Indiana	$302,514	Texas	$668,460
Iowa	$204,938	Utah	$145,957
Kansas	$230,885	Vermont	$84,172
Kentucky	$182,148	Virginia	$243,051
Louisiana	$204,058	Washington	$206,220
Maine	$107,242	West Virginia	$140,570
Maryland	$186,902	Wisconsin	$260,053
Massachusetts	$214,283	Wyoming	$94,237
Michigan	$331,393		
Minnesota	$262,068		
Mississippi	$177,883	American Samoa	$66,207
Missouri	$266,548	Guam	$67,353
Montana	$118,746	Northern Mariana Islands	$65,973
Nebraska	$183,399	Puerto Rico	$126,417
Nevada	$123,594	US Virgin Islands	$66,984

Fallon Paiute-Shoshone Tribe, NV	$25,688
Inter Tribal Council, AZ	$160,000
Menominee Indian Tribe, WI	$24,487
Pueblo of Acoma, NM	$25,688
Pueblo of Laguna, NM	$25,688
Pyramid Lake Paiute Tribe, NV	$25,688
Reno Sparks Indian Colony, NV	$25,688
St. Regis Mohawk Tribe, NY	$24,200
Salish & Kootenai Tribes, MT	$10,000
Shoshone Paiute Tribe, NV	$25,688
Grand Total	$12,800,000

Table 6. HMEP State Grant Dispersal FY 05 (DOT 2005)

Hazardous Materials Emergency Preparedness (HMEP) Grants Made for Use in Fiscal Year 2005*

Alabama	$236,183	New Hampshire	$106,013
Alaska	$82,560	New Jersey	$289,579
Arizona	$183,283	New Mexico	$150,123
Arkansas	$158,959	New York	$470,968
California	$964,316	North Carolina	$316,260
Colorado	$181,716	North Dakota	$137,298
Connecticut	$145,112	Ohio	$510,751
Delaware	$91,223	Oklahoma	$188,028
District of Columbia	$73,484	Oregon	$175,178
Florida	$453,407	Pennsylvania	$404,762
Georgia	$300,494	Rhode Island	$92,480
Hawaii	$88,920	South Carolina	$190,616
Idaho	$113,259	South Dakota	$126,980
Illinois	$612,982	Tennessee	$249,996
Indiana	$302,514	Texas	$668,460
Iowa	$204,938	Utah	$145,957
Kansas	$230,885	Vermont	$84,172
Kentucky	$182,148	Virginia	$243,051
Louisiana	$204,058	Washington	$206,220
Maine	$107,242	West Virginia	$140,570
Maryland	$186,902	Wisconsin	$260,053
Massachusetts	$214,283	Wyoming	$94,237
Michigan	$331,393		
Minnesota	$262,068		
Mississippi	$177,883	American Samoa	$66,207
Missouri	$266,548	Guam	$67,353
Montana	$118,746	Northern Mariana Islands	$65,973
Nebraska	$183,399	Puerto Rico	$126,417
Nevada	$123,594	US Virgin Islands	$66,984

Fallon Paiute-Shoshone Tribe, NV	$27,148
Inter Tribal Council, AZ	$160,000
Menominee Indian Tribe, WI	$26,055
Prairie Island Indian Community, MN	$21,710
Pueblo of Acoma, NM	$26,005
Pueblo of Laguna, NM	$26,004
Pyramid Lake Paiute Tribe, NV	$26,005
Reno Sparks Indian Colony, NV	$25,688
St. Regis Mohawk Tribe, NY	$24,200
Salish & Kootenai Tribes, MT	$10,000
Grand Total	$12,800,000

Table 7. Federal Hazmat Registration Fee Schedule (DOT 2005)

Registration Fee Table

As Amended by the Final Rule of January 9, 2003

A final rule published in the Federal Register on January 9, 2003, reduced the annual fees for registration years 2003-2004, 2004-2005, and 2005-2006 to $150 for persons that meet the SBA size standard for a small business and for the newly established business category for not-for-profit organizations (organizations exempt from taxation under 26 U.S.C. 501(a)), and to $300 for all other persons, and for registration year 2006-2007 and following to $275 for small businesses and not-for-profit organizations, and to $1000 for all other persons. The fees previously established for registration years 1992-1993 through 2002-2003 remain in effect.

One, two, or three year periods of registration are permitted for years beginning July 1, 2000, and later. The fees for all possible registration periods and business types are listed in this table. All fees include the appropriate processing fee.

If you are a not-for-profit organization registering for 2001-2004, 2002-2004 or 2002-2005, you must pay the fee in the column titled "Small Business/ Non-Profit" if you met the SBA size standard for a small business between July 1, 2002, and June 30, 2003, and the fee in the column titled "Not-Small Business/Non-Profit" if you did not meet that standard during that year.

Registrants whose SBA business size changed within a period for which a multiple-year registration could otherwise be submitted are advised to register for the years in which they qualified as a small business separately from the years for which they do not qualify as a small business.

Registration Period	Small Business	All Non-Profit	Not-Small Business	
2005-2006 (1 year)	$150	$150	$300	-
2005-2007 (2 years)	$400	$400	$1,275	-
2005-2008 (3 years)	$650	$650	$2,250	-
Expedited Registration Follow-up Payment for Not-Small Business for 2005-2006 is $150				
2004-2005 (1 year)	$150	$150	$300	-
2004-2006 (2 years)	$275	$275	$575	-
2004-2007 (3 years)	$525	$525	$1,550	-
2003-2004 (1 year)	$150	$150	$300	-
2003-2005 (2 years)	$275	$275	$575	-
2003-2006 (3 years)	$400	$400	$850	-
	Small Business	Small Business Non-Profit	Not-Small Business	Not Small Business/ Non-Profit
2002-2003 (1 year)	$300	-	$2,000	-
2002-2004 (2 years)	$425	$425	$2,275	$2,125
2002-2005 (3 years)	$550	$550	$2,550	$2,250
2001-2002 (1 year)	$300	-	$2,000	-
2001-2003 (2 years)	$575	-	$3,975	-
2001-2004 (3 years)	$700	$700	$4,250	$4,100
2000-2001 (1 year)	$300	-	$2,000	-
2000-2002 (2 years)	$575	-	$3,975	-
2000-2003 (3 years)	$850	-	$5,950	-
1992-1993 through 1999-2000 the annual fee is $300 for all registrants				

Table 8. Hazmat Fees, HMEP Grant Dispersal, and Incidents by State (DOT 2004)

Hazardous Materials Registration Fees, HMEP Grants, and Incidents by State

	Grant Fees* Collected for Registration Year 2002 - 2003**		Grants Made for Use in Fiscal Year 2004		Number of Incidents in Calendar Year 2003			
					All Incidents		Serious*** Incidents Only	
Alaska	65,900	*0.31%*	82,560	*0.65%*	6	*0.04%*	0	0.00%
Alabama	335,100	*1.56%*	236,183	*1.85%*	194	*1.28%*	16	3.59%
Arkansas	222,700	*1.04%*	158,959	*1.24%*	145	*0.96%*	10	2.24%
Arizona	200,375	*0.93%*	183,283	*1.43%*	235	*1.56%*	9	2.02%
California	1,442,775	*6.71%*	964,316	*7.53%*	1,193	*7.90%*	14	3.14%
Colorado	349,200	*1.62%*	181,716	*1.42%*	378	*2.50%*	9	2.02%
Connecticut	397,850	*1.85%*	145,112	*1.13%*	278	*1.84%*	5	1.12%
District of Columbia	10,250	*0.05%*	73,484	*0.57%*	9	*0.06%*	0	0.00%
Delaware	79,775	*0.37%*	91,223	*0.71%*	34	*0.23%*	2	0.45%
Florida	641,550	*2.98%*	453,407	*3.54%*	641	*4.25%*	30	6.73%
Georgia	548,975	*2.55%*	300,494	*2.35%*	436	*2.89%*	13	2.91%
Hawaii	69,225	*0.32%*	88,920	*0.69%*	8	*0.05%*	1	0.22%
Iowa	403,550	*1.88%*	204,938	*1.60%*	110	*0.73%*	6	1.35%
Idaho	126,375	*0.59%*	113,259	*0.88%*	43	*0.28%*	2	0.45%
Illinois	1,090,425	*5.07%*	612,982	*4.79%*	1,240	*8.21%*	14	3.14%
Indiana	607,725	*2.83%*	302,514	*2.36%*	373	*2.47%*	10	2.24%
Kansas	346,325	*1.61%*	230,885	*1.80%*	395	*2.62%*	9	2.02%
Kentucky	292,200	*1.36%*	182,148	*1.42%*	226	*1.50%*	8	1.79%
Louisiana	346,500	*1.61%*	204,058	*1.59%*	241	*1.60%*	10	2.24%
Massachusetts	516,175	*2.40%*	214,283	*1.67%*	248	*1.64%*	7	1.57%
Maryland	298,175	*1.39%*	186,902	*1.46%*	257	*1.70%*	9	2.02%
Maine	133,875	*0.62%*	107,242	*0.84%*	40	*0.26%*	2	0.45%
Michigan	632,025	*2.94%*	331,393	*2.59%*	307	*2.03%*	7	1.57%
Minnesota	578,700	*2.69%*	262,068	*2.05%*	252	*1.67%*	8	1.79%
Missouri	549,500	*2.56%*	266,548	*2.08%*	322	*2.13%*	13	2.91%
Mississippi	233,000	*1.08%*	177,883	*1.39%*	131	*0.87%*	5	1.12%
Montana	106,025	*0.49%*	118,746	*0.93%*	45	*0.30%*	1	0.22%
North Carolina	573,850	*2.67%*	316,260	*2.47%*	437	*2.89%*	12	2.69%
North Dakota	100,900	*0.47%*	137,298	*1.07%*	26	*0.17%*	1	0.22%
Nebraska	231,600	*1.08%*	183,399	*1.43%*	65	*0.43%*	3	0.67%
New Hampshire	139,275	*0.65%*	106,013	*0.83%*	19	*0.13%*	0	0.00%
New Jersey	782,601	*3.64%*	289,579	*2.26%*	507	*3.36%*	11	2.47%
New Mexico	115,300	*0.54%*	150,123	*1.17%*	58	*0.38%*	2	0.45%
Nevada	131,550	*0.61%*	123,594	*0.97%*	78	*0.52%*	5	1.12%
New York	884,700	*4.12%*	470,968	*3.68%*	389	*2.58%*	12	2.69%
Ohio	1,076,500	*5.01%*	510,751	*3.99%*	1,221	*8.09%*	20	4.48%
Oklahoma	298,625	*1.39%*	188,028	*1.47%*	177	*1.17%*	11	2.47%
Oregon	273,950	*1.27%*	175,178	*1.37%*	228	*1.51%*	3	0.67%
Pennsylvania	1,124,625	*5.23%*	404,762	*3.16%*	961	*6.36%*	20	4.48%
Rhode Island	99,800	*0.46%*	92,480	*0.72%*	34	*0.23%*	1	0.22%
South Carolina	280,175	*1.30%*	190,616	*1.49%*	182	*1.21%*	10	2.24%

Table 8. (Con't)

Hazardous Materials Registration Fees, HMEP Grants, and Incidents by State

	Grant Fees* Collected for Registration Year 2002 - 2003**		Grants Made for Use in Fiscal Year 2004		Number of Incidents in Calendar Year 2003			
					All Incidents		Serious*** Incidents Only	
South Dakota	109,375	*0.51%*	126,980	*0.99%*	15	*0.10%*	2	0.45%
Tennessee	502,250	*2.34%*	249,996	*1.95%*	801	*5.30%*	12	2.69%
Texas	1,685,238	*7.84%*	668,460	*5.22%*	1,213	*8.03%*	57	12.78%
Utah	154,725	*0.72%*	145,957	*1.14%*	211	*1.40%*	8	1.79%
Virginia	460,375	*2.14%*	243,051	*1.90%*	200	*1.32%*	13	2.91%
Vermont	56,650	*0.26%*	84,172	*0.66%*	20	*0.13%*	2	0.45%
Washington	413,325	*1.92%*	206,220	*1.61%*	149	*0.99%*	4	0.90%
Wisconsin	633,200	*2.95%*	260,053	*2.03%*	217	*1.44%*	0	0.00%
West Virginia	100,150	*0.47%*	140,570	*1.10%*	50	*0.33%*	5	1.12%
Wyoming	86,200	*0.40%*	94,237	*0.74%*	22	*0.15%*	5	1.12%
American Samoa	275	*0.00%*	66,207	*0.52%*	0	*0.00%*	0	0.00%
Guam	14,275	*0.07%*	67,353	*0.53%*	0	*0.00%*	0	0.00%
Northern Mariana Islar	0	*0.00%*	65,973	*0.52%*	0	*0.00%*	0	0.00%
Puerto Rico	135,300	*0.63%*	126,417	*0.99%*	11	*0.07%*	5	1.12%
US Virgin Islands	0	*0.00%*	66,984	*0.52%*	0	*0.00%*	0	0.00%
Other	405,725	*1.89%*	372,815	*2.91%*	22	*0.15%*	2	0.45%
Grand Total	**21,494,764**		**12,800,000**		**15,100**		**446**	

* Grant fees collected as of 5/4/2004

** State of collection is the reported state of the principal place of business, and does not necessarily indicate the state or states of business activity.

*** RSPA revised the definition of a serious incident in 2002. This report uses the current definition:
- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 gallons or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 119 gallons or 882 pounds) of a hazardous material.

Table 9. Federal Hazmat Registration FY 2001-2005

State	Registration by Year					Average	Trend
	FY 01	FY 02	FY 03	FY 04	FY 05	FY01-05	FY05-FY01
Alaska	115	116	118	124	123	119	8
Alabama	688	690	693	710	690	694	2
Arizona	375	379	394	402	400	390	25
Arkansas	451	443	435	416	408	431	-43
California	2842	2737	2699	2688	2669	2727	-173
Colorado	656	651	674	681	659	664	3
Connecticut	790	829	827	828	820	819	30
Deleware	107	122	125	122	128	121	21
District of Columbia	10	12	12	13	12	12	2
Florida	1250	1298	1374	1389	1374	1337	124
Georgia	1103	1108	1170	1178	1176	1147	73
Hawaii	127	132	139	136	134	134	7
Idaho	275	279	263	255	245	263	-30
Illinois	2143	2149	2105	2093	2039	2106	-104
Indiana	1129	1127	1113	1102	1075	1109	-54
Iowa	890	876	882	871	850	874	-40
Kansas	871	864	888	866	841	866	-30
Kentucky	589	585	579	592	592	587	3
Louisiana	675	666	649	642	642	655	-33
Maine	293	296	308	306	304	301	11
Maryland	521	523	522	534	524	525	3
Massachusetts	1063	1051	1083	1089	1101	1077	38
Michigan	1123	1112	1110	1120	1100	1113	-23
Minnesota	1100	1127	1138	1119	1119	1121	19
Mississippi	454	451	431	429	430	439	-24
Missouri	1147	1156	1130	1108	1094	1127	-53
Montana	261	251	267	258	259	259	-2
Nebraska	517	506	507	501	479	502	-38
Nevada	242	266	275	277	270	266	28
New Hampshire	257	254	256	261	263	258	6
New Jersey	1504	1455	1452	1442	1408	1452	-96
New Mexico	228	254	284	292	286	269	58
New York	1698	1664	1675	1709	1732	1696	34
North Carolina	1056	1067	1073	1080	1047	1065	-9
North Dakota	274	272	272	279	274	274	0
Ohio	1844	1818	1820	1793	1757	1806	-87
Oklahoma	708	712	700	681	672	695	-36
Oregon	520	530	517	502	491	512	-29
Pennsylvania	2022	1993	1970	1939	1933	1971	-89
Rhode Island	210	225	229	235	227	225	17
South Carolina	542	561	564	570	553	558	11
South Dakota	267	280	276	265	276	273	9
Tennessee	830	852	850	863	845	848	15
Texas	3161	3244	3266	3340	3307	3264	146
Utah	302	320	325	339	329	323	27
Vermont	139	145	148	156	161	150	22

Virginia	784	828	834	815	793	811	9
Washington	697	734	741	730	714	723	17
West Virginia	216	212	215	202	201	209	-15
Wisconsin	1087	1114	1087	1062	1071	1084	-16
Wyoming	214	220	218	229	229	222	15
Totals	40367	40556	40682	40633	40126	40473	-241

Table 10. Highway Hazmat Incidents FY 2001-2005

State	Incidents by Year					Average	Registration Avg	Incidents per
	FY 01	FY 02	FY 03	FY 04	FY 05	FY 01-05	FY 01-05	100 Reg
Alaska	2	3	0	3	0	2	119	1.3
Alabama	181	179	186	149	159	171	694	24.6
Arizona	196	180	218	220	211	205	390	52.6
Arkansas	176	183	147	131	138	155	431	36.0
California	1100	954	1074	1094	844	1013	2727	37.2
Colorado	329	319	369	344	188	310	664	46.6
Connecticut	341	345	280	242	180	278	819	33.9
Deleware	32	29	33	22	16	26	121	21.9
District of Columbia	7	5	9	14	1	7	12	61.0
Florida	697	521	622	459	447	549	1337	41.1
Georgia	423	382	420	376	319	384	1147	33.5
Hawaii	5	1	6	3	4	4	134	2.8
Idaho	25	36	43	30	28	32	263	12.3
Illinois	1349	1246	1180	1013	729	1103	2106	52.4
Indiana	519	408	370	355	235	377	1109	34.0
Iowa	161	128	99	124	121	127	874	14.5
Kansas	324	379	354	286	234	315	866	36.4
Kentucky	187	209	146	142	160	169	587	28.7
Louisiana	199	156	179	208	164	181	655	27.7
Maine	37	29	38	30	20	31	301	10.2
Maryland	339	285	246	301	176	269	525	51.3
Massachusetts	286	265	242	189	166	230	1077	21.3
Michigan	287	260	291	232	184	251	1113	22.5
Minnesota	275	234	238	248	200	239	1121	21.3
Mississippi	153	156	131	120	90	130	439	29.6
Missouri	338	328	297	269	293	305	1127	27.1
Montana	22	30	38	38	22	30	259	11.6
Nebraska	77	70	63	49	39	60	502	11.9
Nevada	93	55	74	58	64	69	266	25.9
New Hampshire	20	14	16	20	18	18	258	6.8
New Jersey	362	399	472	348	308	378	1452	26.0
New Mexico	66	58	46	57	39	53	269	19.8
New York	608	420	369	452	323	434	1696	25.6
North Carolina	702	624	415	503	335	516	1065	48.5

North Dakota	25	22	24	22	19	22	274	8.2
Ohio	1391	1109	1089	984	897	1094	1806	60.6
Oklahoma	251	129	180	185	146	178	695	25.7
Oregon	230	200	216	217	144	201	512	39.3
Pennsylvania	1018	929	959	964	662	906	1971	46.0
Rhode Island	19	30	33	23	19	25	225	11.0
South Carolina	156	144	174	147	134	151	558	27.1
South Dakota	15	12	17	11	9	13	273	4.7
Tennessee	822	600	523	570	403	584	848	68.8
Texas	1059	1050	1104	1140	1003	1071	3264	32.8
Utah	285	156	201	169	140	190	323	58.9
Vermont	14	12	18	17	9	14	150	9.3
Virginia	176	148	160	117	132	147	811	18.1
Washington	165	149	135	138	150	147	723	20.4
West Virginia	76	63	49	55	27	54	209	25.8
Wisconsin	292	234	213	251	140	226	1084	20.8
Wyoming	17	23	17	18	13	18	222	7.9
Totals	15929	13900	13823	13157	10502	13462	794	28.3

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Vita

Captain David Pastika graduated from Stratford High School, Goose Creek, SC in 1992. He then enrolled in the University of Minnesota-Duluth and joined the ROTC program and graduated with a Bachelor of Arts in Geography and was commissioned as a second lieutenant through ROTC Detachment 210 in February of 1998.

His first assignment was at Pensacola Naval Air Station where he attended Undergraduate Navigator Training. From there he was then assigned to Holloman AFB in New Mexico where he was flight commander of the Logistics Plans flight until June of 2001. He then reported to Beale AFB in California where he also served as Logistics Plans Flight Commander until he was deployed overseas to Incirlik AB, Turkey in June 2002. While at Incirlik, he ran the Logistics Operations Center and worked closely with Turkish Air Force personnel in coordinating incoming and outgoing units in support of OPERATION NORTHERN WATCH and OPERATION NOBLE EAGLE. In August 2004, he reported to the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to Ramstein AB, Germany where he is assigned to the A-4 Logistics branch at Headquarters USAFE.

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14. ABSTRACT

Every day, over 800,000 hazmat transactions take place across the United States. This segment of transportation is expected to grow at a modest two percent a year for the foreseeable future but differences of regulations between the state and Federal level have been a growing concern for both the government and members of the hazmat industry. A patchwork of often inconsistent permits, registration requirements, and hazmat organizational structures at the state level often create barriers to the efficient means of commerce for hazmat carriers and shippers.

This thesis explores the history of hazardous regulations since de-regulation of the trucking industry and focuses specifically on the past decade of Federal legislation that has contributed to the growing disparity between state hazmat programs and policies. Finally, the events of September 11th, 2001 have changes many laws and legislation pertaining to hazmat and this research portrays the effects of the terrorist attacks at the state level. This research included a meta-analysis approach and also collected empirical data about existing state-level hazmat policies from a sample of seven states. The results are published in the form of charts and interpretive graphical maps designed to show patterns not previously displayed by any other types of research in this area of study.

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