

## 3.0 Description of Serious Crash Database

### 3.1 Database Description

As described in Section 2, several database users and managers suggested an augmentation of the current information contained in HMIS and MCMIS. In response to this suggestion, the Battelle team developed a relational electronic database form capable of capturing information attributes thought to be essential for developing an improved description of serious HM truck crashes. Since all the records being augmented were in HMIS and/or MCMIS, the effort began by importing pertinent records from those databases using a series of queries. The forms were then used to manually input supplemental data obtained from the PARs and from phone calls to the carrier or other key persons involved in the crash. What follows is a description of the database form design and use.

The starting screen presents the user with several options (see Figure 3-1). The “Crash Notification” button initiates data entry for a crash. “UN Number” allows the user to change the two-digit class and division code for a given UN number. “Commodity” enables the user to enter or change the definition of a particular commodity, the two digit HM code, UN number, short and long name, the reportable quantity (RQ) limit or if the material is “poisonous by inhalation.” The basis for this information is the Hazardous Materials Table presented in 49 CFR 172.101. “Package” allows the user to enter the name and description of a package that was used for transporting HM before the crash (e.g., MC 307 cargo tank for transporting gasoline). “DOT Number” permits the user to enter a carrier’s DOT number, address, phone number, or fax number into the database. [Note: One of the first activities performed when the database was being initialized was to enter the information for about 40,000 carriers; this task was performed so that when information from a PAR is entered, the carrier information in the

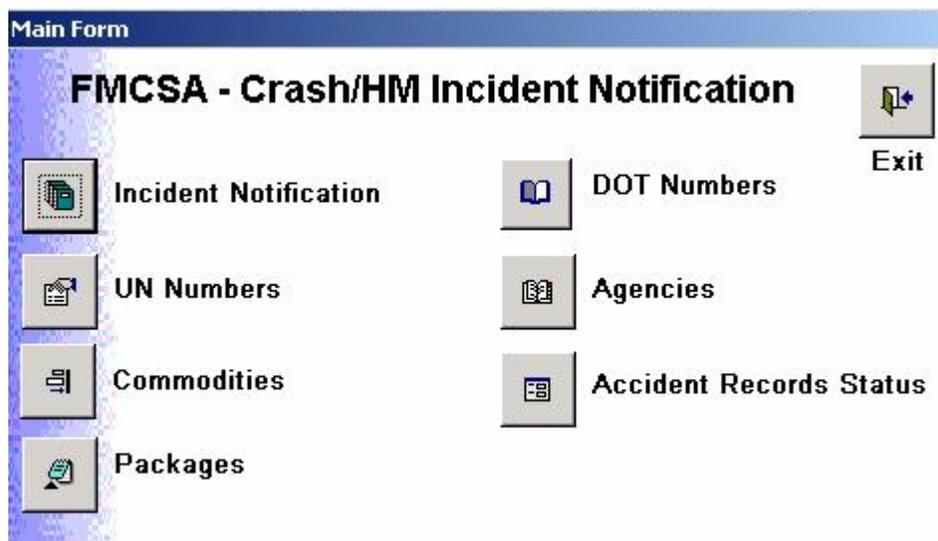


Figure 3-1. Main Database Entry Screen for the Serious Crash Database

PAR need only be checked to ensure that it is current]. “Agency” permits the user to enter the name of the agency providing the crash information and “Accident Record Status” summarizes the completeness of the record.

The buttons shown in Figure 3-1 provide a means of entering standard information about the commodity being shipped and the carrier. When a new crash is being entered, these buttons provide a means of checking to ensure that the carrier is listed by DOT number and the commodity and packaging information are already in the database. If they are not shown, these items can be entered with this screen if the carrier and hazardous material screens are populated.

Of the options presented in Figure 3-1, only the “Crash Notification” selection prompts several additional screens required to fully describe the crash sequence and associated details. When the “Crash Notification” button is pressed, the screen shown in Figure 3-2 pops up. Any fields that have been pre-populated using queries of MCMIS and HMIS reports will appear filled as the screens pop up.

Most of the fields shown in Figure 3-2 are self-explanatory. “Crash Key” is the MCMIS report number. The notification information fields were designed for use by DOT personnel, but were not populated as part of the Phase I data collection effort. If the crash appeared in the HMIS database, the remarks from the HMIS record are provided in the “Description” field. Otherwise, the descriptions were obtained from the PAR, if available. At the bottom of the screen shown in Figure 3-2, there are a series of navigation buttons that enable the user to move from one record to another. Delete, print and exit options are also provided. When the print button is selected, a complete report for that crash is created and sent to the printer.

Seven additional tabs are located at the top of the “Crash Notification” screen. When any of these tabs is selected, an additional data entry screen is displayed. Some have sub-screens. The following discussion provides more detail on these features.

Figure 3-3 shows the information contained on the location screen. For many of the entries shown, a drop-down pick list is provided. For example, once the abbreviation of the state is selected, the county selection is made from among the counties associated with that state. Similarly, the selected place is populated from the list of places under the selected state. The county and place pick lists are based on the U.S. Bureau of the Census FIPS listings.

Many of the remaining entries are also made from pre-selected lists. In almost all cases, these lists coincide with eligible entries for that field in MCMIS. As a result, a more consistent and accurate database is realized.

There are some fields, particularly those associated with the crash location, that are not associated with pick lists. In addition, the longitude and latitude coordinates were not always populated; utilizing GIS to complete these fields was not pursued as part of Phase I.

Incident	Location	Incident Details	Agency Response	Vehicles Involved	Fatalities/Injuries	Notifications
Incident Key	wv10042001					
Date of Incident	10/4/2001	Crash Involved?	<input type="checkbox"/>	Hazardous Material Incident?	<input checked="" type="checkbox"/>	
Incident Time (hh:min AM/PM)	7:00 PM	Information Source				
Division Office:						
Notified on Date (mm/dd/yyyy)		Time (hh:min AM/PM)				
Response Date (mm/dd/yyyy)		Response Time (hh:min AM/PM)				
Headquarters Notification:						
Notified on Date (mm/dd/yyyy)		Time (hh:min AM/PM)				
Description	<p>Single vehicle crash involving a truck/tractor trailer combination. The shipment was picked up at Letterkenny Army Depot, near Chambersburg, PA. The destination was Indiana Ordnance Works, near Charlestown, IN. The shipment was routed south on I-81 to I-64 West (near Lexington, VA). Then I-64 to Indiana and North to Charlestown, IN. This is not the most direct route for this trip. The carrier uses a computer program to perform all D. O. D. Explosive HM Routing. The computer assigned this route. Preliminary findings indicate that the driver was drinking coffee, choked, and lost control of the vehicle. The vehicle entered the median, overturned, breaking some of the canister's containing the HM (Charges, Propellant, 1.3C, UN-0242). The area surrounding the crash scene was evacuated within a one-mile radius. This is</p>					

**Figure 3-2. Crash Summary Screen**

**Incident Reports**

**Incident Location Incident Details Agency Response Vehicles Involved Fatalities/Injuries Notifications**

Please specify the location of the incident/accident.

State

County

Place

Road Type  Divided/Limited Access

Road Surface  Number of Lanes:

Posted Speed:

Trafficway

Latitude (degree)  Longitude (degree)

Specific Location

Highway /Road /Street

Land Use

Community

Navigation icons: Home, Previous, Next, Previous, Next, Print, Save, Cancel, Find, Help

**Figure 3-3. Crash Location Screen Information**

Figure 3-4 provides additional detail information. The drop-down lists are based on standard terminology used in MCMIS. The “Event Details” provide an opportunity to include additional information that was not included in the accident description field on the Crash screen. The intent is that the information on this screen would focus more on crash sequences and causes.

**Incident Reports**

Incident	Location	Incident Details	Agency Response	Vehicles Involved	Fatalities/Injuries	Notifications
Cause of Incident		Excess speed for road conditions				
First Harmful Event		Overturn (Rollover)				
Vehicles Involved		truck/tractor trailer combination				
Event Details		Driver was drinking coffee, choked, and lost control of the vehicle. The vehicle entered the median, overturned, breaking some of the canister's containing the HM (Charges, Propellant, 1.3C, UN-0242).				
Road Condition						
Weather Condition		No Adverse Condition				
Light Condition		Dusk				
Citation Issued:						
Issued To		Driver - First Last				
Charges		Failure to maintain cont				
Issued By						
Penalties						
Status of charge						

**Figure 3-4. Crash Details Data Entry Screen**

Information about the responding agency appears in Figure 3-5. These entries are considered informative, but optional. For Phase I, if the information could not be obtained from the PAR, no effort was made to contact the reporting or the responding agency.

**Incident Reports**

Incident | Location | Incident Details | **Agency Response** | Vehicles Involved | Fatalities/Injuries | Notifications

Responding Agencies (multiple entries permitted):

Responding Agency	Public Utility Commission
Notification Time (min)	
Response Time (min)	
Contact Name	
Contact Title	
Contact Phone	
email	
Description of Emergency Response	The area surrounding the crash scene was evacuated within a one-mile radius. An E. D. D. Team performed cleanup. The co-driver of the vehicle was extricated and transported to a local hospital

Record: 1 of 1

**Figure 3-5. Agency Response Information Captured by the Database**

Figure 3-6 represents the first of several screens intended to capture data for each vehicle involved in the crash. If there were three vehicles involved in a single crash, then this screen would be filled out for each vehicle. For each vehicle, there are additional screens for entering carrier, driver, HM information, and whether or not the vehicle was involved in a fire or explosion as a result of the crash.

For each vehicle, the first entry is the vehicle number. This is normally the number assigned to the vehicle in the PAR. The next entry is the designation of the vehicle, normally taken from the PAR. The configuration, impact location, obstructed vision, and cargo body type are all selected from pick lists. Estimated vehicle speed, gross weight, number of axles and trailer description are also entered, predominately from information contained in the PAR.

**Incident Reports**

Incident | Location | Incident Details | Agency Response | **Vehicles Involved** | Fatalities/Injuries | Notifications

Vehicle Information (multiple entries permitted)

Vehicle	Carrier	Driver(s)	Hazmat	Fire/Explosion
Vehicle Number				
Vehicle	tractor, Unit # 91166			
Configuration	Tractor/Semitrailer			
Impact Location		Obstructed Vision:		
Cargo Body Type	Dry box semi trailer			
Vehicle Speed (m/hr)		Vehicle Gross Weight (lbs)		
Number of Axles				
Vehicle has a Trailer?	<input type="checkbox"/>	Trailer Length (ft)		Trailer Width (ft)
Number of Axles on the Trailer				
Notes	Semi trailer is Unit # 448669.			
Non-Hazmat Cargo	NA			

Record: 1 of 1

**Figure 3-6. Information on Vehicles Involved in the Crash**

If there is something noteworthy about the vehicle configuration or the vehicle’s non-HM cargo as listed in the PAR, it can be entered as part of the vehicle description as well.

If the carrier was one of the 40,000 carriers entered initially into the database or if the carrier information was entered as part of another crash, then all of the information shown in Figure 3-7 will be displayed when the DOT number is entered. If the information is different from the carrier information entered for another crash, and the user wants to capture the information, then the “New DOT” button must be clicked and the new information subsequently entered.

The screenshot shows a software window titled "Incident Reports" with several tabs: Incident, Location, Incident Details, Agency Response, Vehicles Involved, Fatalities/Injuries, and Notifications. The "Vehicles Involved" tab is active, displaying "Vehicle Information (multiple entries permitted)".

At the top of the form are five sub-tabs: Vehicle, Carrier, Driver(s), Hazmat, and Fire/Explosion. The "Carrier" sub-tab is selected.

Under the "Carrier" sub-tab, there is a "US DOT #" field with a dropdown menu showing "TT000001" and an "Add US DOT#..." button. Below this is a "Carrier Information:" section with the following fields:

- Name: Motor Carrier Inc
- Address: Any Street
- City: Any City
- State: MO
- Zip: 55555
- Phone: (empty field)
- Fax: (empty field)

At the bottom of the form, there is a "Record:" field showing "1 of 1" with navigation arrows. Below the form is a toolbar with various icons for navigation and editing.

**Figure 3-7. Carrier Information**

The driver information shown in Figure 3-8 is just for the driver associated with the carrier and vehicle that were described on the previous entry screens. Normally there would just be one driver. However, if there is a co-driver that was not driving at the time of the crash, then information on that individual can be entered on a separate screen. Frequently, the PAR will not provide all of the information shown in Figure 3-8. Since much of the missing information is thought to be useful, but not essential, no attempt was made in Phase I to obtain this information from other sources.

**Incident Reports**

Incident | Location | Incident Details | Agency Response | Vehicles Involved | Fatalities/Injuries | Notifications

Vehicle Information (multiple entries permitted)

Vehicle | Carrier | Driver(s) | Hazmat | Fire/Explosion

Driver Information (multiple entries permitted):

Last Name: Last | First Name: First | Middle: | License No: 233761339 | Issued in State: VA | Date of Birth (mm/dd/yyyy): 3/28/1947 | Date of Hire (mm/dd/yyyy): 8/12/1998

Owner Operator?  | Co-Driver?  | Experience (months): 118

Prior Accidents (Previous 3 yrs): No previous crash experience since being employed by the motor carrier.

Died in Accident?  | Died On (mm/dd/yyyy): | Injured in Accident?  | Suspended?

Endorsements: HM  | Tank  | Double/Triple

Record: 1 of 2

**Figure 3-8. Driver Information**

Figure 3-9 is the first of a series of screens that describe the hazardous material being transported by the carrier involved in the crash. The upper part of the screen describes the hazardous material being shipped. In most cases, this information will already be part of the list of hazardous materials entered initially in the database. If not, by clicking the “Add Hazardous Material” button, a new material can be added.

One of the key pieces of information contained on the Hazmat screen is the quantity shipped. Neither MCMIS nor HMIS capture this information. Consequently, the effectiveness of the packaging to resist spillage cannot be determined. An effort was made to obtain this information for the majority of crashes in the Phase I sample.

The bottom part of Figure 3-9 displays the first of several package screens, one that focuses on package type. Additional screens can be brought up concerning the behavior of the package in the crash environment. The Actions, Objects, How, Area and What tabs capture all of the container damage fields in the HMIS database. They are shown in Figures 3-10 through 3-14, respectively. The entries correspond exactly to the container fields in HMIS and multiple responses are permitted.

The screenshot shows a software interface with the following components:

- Navigation Tabs:** Vehicle, Carrier, Driver(s), Hazmat (selected), Fire/Explosion.
- Hazardous Material Information (multiple entries permitted):**
  - UN Number: UN0242
  - Hazardous Material: CHARGES PROPELLING CANNON
  - Qty Shipped: 39720
  - Spill?:
  - Qty Spilled: [ ]
  - Units: Weight (lbs)
- Packaging Information (multiple entries permitted):**
  - Package: MC306
  - Manufacturer: [ ]
  - Package Mfg Date: [ ]
  - Package Insp. Date: [ ]
  - Number Failed: [ ]
  - Number Shipped: [ ]
  - Rollover Protection?: [ ]
  - Protection Type: [ ]
- Record Navigation:** Record: [ ] 1 of 1 (repeated three times at the bottom)

**Figure 3-9. Hazardous Material and Shipping Package Description**

Package	Actions	Objects	How	Area	What
Action contributing to packaging failure					
<input type="checkbox"/> Transport Vehicle Collision	<input type="checkbox"/> Improper Loading	<input type="checkbox"/> Venting	<input type="checkbox"/>		
<input type="checkbox"/> Transport Vehicle Overturn	<input type="checkbox"/> Improper Blocking	<input type="checkbox"/> Vandalism	<input type="checkbox"/>		
<input type="checkbox"/> Overloading/Overfilling	<input type="checkbox"/> Corrosion	<input type="checkbox"/> Incompatible Materials	<input type="checkbox"/>		
<input type="checkbox"/> Loose Fitting Valves	<input type="checkbox"/> Metal Fatigue	<input type="checkbox"/> Other	<input type="checkbox"/>		
<input type="checkbox"/> Defective Fitting Valves	<input type="checkbox"/> Friction/Rubbing	<input type="checkbox"/> Specify:			
<input type="checkbox"/> Dropped	<input type="checkbox"/> Fire/Heat	<input type="checkbox"/>			
<input type="checkbox"/> Struck/Rammed	<input type="checkbox"/> Freezing	<input type="checkbox"/>			

**Figure 3-10. Action Entries under the Package Behavior Screen**

Package	Actions	Objects	How	Area	What
Objects causing failure					
<input type="checkbox"/> Other Freight	<input type="checkbox"/>	Roadside Obstacle	<input type="checkbox"/>		
<input type="checkbox"/> Forklift	<input type="checkbox"/>	None	<input type="checkbox"/>		
<input type="checkbox"/> Nail/Protrusion	<input type="checkbox"/>	Other	<input type="checkbox"/>		
<input type="checkbox"/> Other Transport Vehicle	<input type="checkbox"/>	Specify:			
<input type="checkbox"/> Water/Other Liquid	<input type="checkbox"/>				
<input type="checkbox"/> Ground/Floor/Roadway	<input type="checkbox"/>				

**Figure 3-11. Object Entries under Package Behavior Screen**

Package	Actions	Objects	How	Area	What
How Package(s) failed					
<input type="checkbox"/> Punctured	<input type="checkbox"/>	Rubbed/Abraded	<input type="checkbox"/>		
<input type="checkbox"/> Cracked	<input type="checkbox"/>	Ruptured	<input type="checkbox"/>		
<input type="checkbox"/> Burst/Internal Pressure	<input type="checkbox"/>	Other	<input type="checkbox"/>		
<input type="checkbox"/> Ripped	<input type="checkbox"/>	Specify:			
<input type="checkbox"/> Crushed	<input type="checkbox"/>				

**Figure 3-12. How Package Failed under Package Behavior Screen**

Package	Actions	Objects	How	Area	What
Package area that failed					
End, Forward	<input type="checkbox"/>	Bottom	<input type="checkbox"/>		
End, Rear	<input type="checkbox"/>	Center	<input type="checkbox"/>		
Side, Right	<input type="checkbox"/>	Other	<input type="checkbox"/>		
Side, Left	<input type="checkbox"/>	Specify:			
Top	<input type="checkbox"/>				

**Figure 3-13. Areas Failed Entries under Package Behavior Screen**

Package	Actions	Objects	How	Area	What
What failed on Packages					
Basic Package Material	<input type="checkbox"/>	Hose/Piping	<input type="checkbox"/>		
Fitting/Valve	<input type="checkbox"/>	Inner Liner	<input type="checkbox"/>		
Closure	<input type="checkbox"/>	Other	<input type="checkbox"/>		
Chime	<input type="checkbox"/>	Specify:			
Weld/Seam	<input type="checkbox"/>				

**Figure 3-14. Failed Components under Package Behavior Screen**

The final data screen, as shown in Figure 3-15, is devoted to fire and explosion information. Beyond whether these events occurred, room is provided for a narrative containing additional details of the crash.

Vehicle	Carrier	Driver(s)	Hazmat	Fire/Explosion
<input type="checkbox"/> Fire Involved? <input type="checkbox"/> Vehicle Engulfed in Fire? <input type="checkbox"/>				
<input type="checkbox"/> Explosion Involved?				
Details: <div style="border: 1px solid black; height: 100px; width: 100%;"></div>				

**Figure 3-15. Fire and Explosion Information under Vehicle Screen**

### 3.2 Summary of Database Results

A description of the structure of the Serious HM Crash Database has been presented in Section 3.1. Actual design of this database evolved over several months and reflects the comments of a number of HM transportation stakeholders. Through the process, a consensus emerged that the Serious HM Crash Database has the potential to provide a comprehensive, user-friendly tool for compiling and analyzing information on HM serious crashes.