Module 8: Crash Scene Management

Purpose:

To focus on safety and good practices at the crash scene, identify the effects of stress on crash participants and tools for dealing with stress. This Module provides some principles for an approach to contingency planning for attending traffic collisions.

Learning Outcomes:

Upon completion of the module the participant will be able to:

- Describe the first priority of crash scene management
- Identify at least four common safety hazards at crash scenes
- Identify at least three long term effects of stress on emergency workers
- Describe three tools used in critical incident stress management
- Describe at least three recommendations of the Heilongjiang report for improving emergency response to crashes

Contents:

A. Crash scene Management
B. Stress and the emergency responder
C. Contingency planning
D. Collision Investigation
E. Course training standard/Police Academy

Format:

Overhead Presentation

- General information on crash scene management, crash scene hazards and stress on emergency response workers.

1. Crash Scene Management

1.1 Arrive Alive – (Overhead crashed police car)

The emergency responder is of no use to anyone if he does not arrive safely. Key ingredients in safe arrival are:

- Vehicle is safe to operate and is of adequate size and power
- Vehicle is equipped with adequate lights/siren
- Driver/Operator is properly trained to drive, that is the driver has specialized training to operate an emergency vehicle with respect to safe practices in emergency vehicle operation.
- Driver/operator is properly trained in, and constrained by, written policies and procedures governing emergency vehicle operation, including speed and ignoring traffic control devices such as traffic lights.

In 1992 in Delta, Canada, a police officer was driving to the scene of a serious motor vehicle collision. He was travelling too fast and overdriving his visibility. As he came over the crest of a bridge, he came upon the crash scene, was unable to brake in time and rammed the rear of a vehicle damaged in the earlier crash. Fortunately no one was hurt through his stupidity. The sanctions applied against this officer were as follows:

- Licence grounded for 3 months and not allowed to drive
- Required to undergo a one-day re-evaluation of his driving skills after three months.
- Required to take additional driver training
- Re-assigned to plain-clothes division and not permitted to drive emergency vehicles for two years.

These procedures represent good practices to ensure emergency vehicles are driven in a safe and responsible manner.

1.2 Beware – SAFETY HAZARDS (Overhead – fire fighters)

The emergency responder must be an alert, vigilant and observant person. In seconds he or she must assess the hazards presented by the crash scene.

i) Fire risk or explosion;
ii) Liquid and fuel spills;
iii) Dangerous Cargos;
iv) Electrical hazards;
v) Mechanical hazards; and
vi) Traffic conditions.

1.2.1 Fire risk or explosion

Internal combustion engines (car, truck, tractor, motorcycle) operate on flammable fuels. Fuel spills are quite common in vehicle-to-vehicle collisions and particularly prevalent in motorcycle collisions. A careless smoker, or spark from movement of metal against the road surface can ignite gasoline fumes from a significant distance. The ignition system of passing motorized vehicles is a potentially hazardous source of ignition.

A small gasoline fire, if not suppressed quickly will spread; the gasoline may run underneath the car. Modern cars are full of flammable materials. Fire under the car will expand gasoline in the fuel tank causing an overflow, rubber filler hoses, fuel supply lines, and soldered joints will be destroyed. Pressure may build up within the fuel tank causing an explosion. A fuel tank explosion will spray burning gasoline over a wide area.

Other explosions common to vehicle fires are from burning tires, or from miscellaneous engine components. Rubber tires are an excellent source of combustion. The outer casing will burn for a minute or more, and then the casing will explode spreading burning or semi molten rubber over a wide area.

In 1998 near Hope, British Columbia Canada, the author (Sgt. Greenhalgh) observed a car fire on a Highway in a remote area where there was no fire service available. All that could be done is to stop traffic and wait for the fire to burn itself out. In a period of seven minutes there were five explosions recorded, first the gasoline tank exploded. The majority of this blast was diverted down to the ground, then sideways. Any person standing within 25 metres could have been affected. The next explosions were the front tires. The fuel tank explosions ignited the rear tires. They then exploded about one to two minutes later. Each explosion sent burning debris as far as 30 metres from the vehicle and as high as 25 metres in the air.

Noxious fumes
Modern vehicles are full of a variety of plastics, rubber and other flammable materials. Even certain metals will burn under some circumstances. Care should be taken not to ingest noxious fumes arising from a collision, as they can be highly poisonous.

1.2.2 Liquid and fuel spills

As well as gasoline the following hazardous liquid spills may be observed at vehicle crash: Diesel, Propane, Natural Gas, Engine oil, antifreeze, transmission oil, battery acid, other lubricants, undetermined hazardous commercial cargo.

> **i) Diesel fuel** – not as inflammable or volatile as gasoline, but creates a highly slippery surface with a coefficient of friction similar to ice. Hazardous to emergency workers on foot and extremely hazardous to two wheeled vehicles. Diesel does not evaporate as quickly as gasoline and MUST be cleaned off the highway in some fashion. Common practice is to use a highly absorbent material

similar to brand name Absorbo, then coat the surface with sand or fine gravel. In the absence of a specialized substance such as Absorbo, soil may be helpful to soak some of it up and will provide some grip for persons on foot.

ii) Propane – This is called liquefied petroleum gas (LPG) and is a useful clean by-product of the process of distilling gasoline. Kept in a liquid state under pressure the storage tanks are commonly rated at 220 to 240 lbs per square inch. This flammable gas liquefies under pressure. It "boils" and turns into vapour at a temperature well below freezing. LPG fuelled vehicles are not uncommon in the motorized world.

Two potential crash scenarios exists:

a. LPG fuelled vehicle, with a 50 to 200-litre tank usually mounted in the rear, sometimes on the roof.

Crashes involving damage to the fuel system of an LPG fuelled vehicle usually just cause the fuel to vent into vapour. It can be ignited by a match, spark or cigarette but is not as volatile as gasoline. The fuel tank itself is heavy, durable and should be protected by skid plates. An explosion is rare; sometimes the fuel may burn as a "jet" from the tank. In many respects the fuel is safer than gasoline. A qualified person can often turn off a venting tank with damaged valves at the tank, providing management of ignition sources is under way within two or three hundred metres. If not the tank must be vented until empty. This means stopping all traffic, as traffic is an ignition source. LPG is heavier than air, will sink into a low area (i.e. A ditch or field) and may take some hours to disperse fully. Nearby homes and businesses should be evacuated.
Breathing LPG contaminate air can kill (rarely) but it will generally create dizziness, shortness of breath. Keeping a victims head up and heading for the high ground is usually beneficial. There are no known long-term effects from exposure, the gas is relatively benign.

b. LPG tanker delivering industrial quantities

This is a potential bomb with potential for major catastrophe. Whilst rare, multiple fatality disasters involving LPG tankers have occurred in jurisdictions as far apart as Spain, New York State and British Columbia Canada, during the past 10 years. The priority response to this requires immediately evacuating persons and removing ignition sources within at least one kilometre.

iii) Natural Gas commonly called Compressed Natural Gas **(CNG).** Some similarities exist to LPG and also some differences. CNG is kept in vapour form in tanks rated in excess of 3000 psi. That is ten times the strength of LPG tanks. CNG is quite volatile, but is lighter than air and disperses readily. Potentially,

CNG powered vehicles are also a bomb but the author is unaware of any significant related vehicle explosions. The tanks are very heavy and equipped with shut off valves should the gas flow rate suddenly exceed that required to normally power the vehicle. Western Canada has one of the highest densities of CNG powered vehicles in the world and their experience over the past decade indicates these vehicles to be very safe.

Standard practice is to remove all ignition sources and ensure the tank fuel supply is switched off. These tanks are usually very large, and often mounted in the rear, occasionally on the roof.

Underground supply lines in urban and suburban areas usually deliver CNG, so tanker transportation has not been a road safety issue. The large above ground storage facilities however, whilst very safe, have theoretical potential for a massive explosion.

iv) Engine oil – We are all quite familiar with this. It is flammable and makes a good fire, but is not easily ignited. If left untreated on the road surface it is hazardous to rescue workers and other traffic particularly two wheeled vehicles. Standard practice is application of Absorbo, if not available use loose material such as sand, gravel, and dirt. It should then be shovelled up and removed.

v) Antifreeze also known as Radiator coolant. Common practice is to fill the cooling system with a mixture of glycol and water. Radiator leaks are the most common type of liquid leak at motor vehicle crashes due to the front-end proximity and the fragility of the radiator. The glycol component is very toxic if consumed. As it tastes sweet, animals will lick at it if it is not cleaned up. If they consume any quantity they will die in agony due to liver failure within a few hours. Glycol is also toxic when it enters the water drainage system. It should be cleaned up wherever possible. There is a cheap substitute for glycol-based coolant that is based on a petroleum distillate. This is now very rare, but it is a flammable liquid and should be treated like gasoline in the unlikely event it is encountered at a crash scene.

vi) Transmission oil and other lubricants – Automatic transmission oil and other lubricants will ignite under the right circumstances. Overheated automatic transmissions are a major source of car fires in the developed world. These substances are another hazard to other traffic and need to be absorbed and removed from the road surface.

vi) Battery acid - This is corrosive, produces flammable gases and is therefore explosive. One of the first things the Fire Dept., does upon attendance at a crash scene in the motorized world, where damage is severe, is to disable the car battery. This is a top priority when occupants are trapped in a car. The Fire Dept. uses a pair of long handled bolt cutters, usually with a handle 50to 100cm, long and cuts the cables to the battery.

- The battery must be disabled to remove a potential ignition source for fire
- The battery must be disabled if the car is equipped with airbags to reduce the risk of airbag deployment.
- A battery explosion rarely causes death but has caused blindness and disfiguring acid burns to the skin.
- Battery acid looks just like water but has a distinctive odour.

1.2.3 Dangerous Cargo

Potentially hazardous materials are transported every day by Commercial Vehicle. The developed world has strict procedures in place governing movement of Dangerous Goods. The goods are classified into a variety of categories i.e.:

- Poisonous/Toxic
- Inflammable
- Explosive

Dealing with Dangerous Goods is a specialized field requiring special training to deal with from an emergency response perspective. Primary responsibility for Dangerous Goods found at crash scenes lies with the Fire Dept. whose trained specialists spend many weeks acquiring expertise in this area. Even from an enforcement perspective, in the developed world the enforcement officers are quite specialized and Dangerous Goods enforcement is usually their only responsibility.

Commercial truck drivers must take training and, carry a licence endorsement permitting them to transport dangerous or hazardous goods before they can do so.

Commercial vehicles transporting Dangerous/Hazardous goods are required by law to display on the cargo box red reflective placards carrying a symbol (i.e. A flame) and a number.

The first attending officer observing the red placard will know from the symbol if the cargo is a fire risk, explosion risk, or poison risk. The police radio dispatcher can then access a National telephone service 24 hours a day, where a trained person will identify from the number provided by the officer, the precise nature of the dangerous cargo. This person will also have at hand a manual listing the proper procedures for:

- Medical treatment for physical exposure
- Proper distance for evacuation
- Distance for reducing ignition sources
- Fire suppression advice
- Decontamination advice
- And other specialized advice as pertinent to the dangerous substance

A rare occurrence, but one requiring special military assistance for example, would be a collision with a commercial vehicle carrying military ordnance.

1.2.4 Electrical Hazard

In North America much electricity is delivered house to house, along overhead wires carried by poles erected alongside the highway. Most are made of wood and collisions with these are common. The wires fall down and electrify the ground for some distance. This creates an **invisible** hazard. Generally the interior of a vehicle is a safe place to stay because rubber tires will not transmit electricity. Persons stepping out of a vehicle complete the circuit whilst they are in contact with both the ground and the vehicle. If electrocuted they will lose muscle control and fall to the ground. Persons going to their aid may also be electrocuted. This problem is made worse if there is rain or water present, as this substance is a good conductor of electricity. Every effort must be made to shut off the electrical power before rendering aid.

In 1996 in Delta Canada, a collision occurred where at a speed of 70 kHz a vehicle struck a power pole. The driver was not seat belted and was thrown through the windshield. The car bounced back off the pole. The driver fell in front of the car, next to the pole. Damaged wires electrified the vehicle and ground, the wooden pole began to burn. The victim began to burn; nothing could be done as it took 20 minutes to turn the power off. A rescuer would also have been electrocuted and possibly burned. The car did not burn, and if the occupant had worn a safety belt he would not have been ejected. He would have walked away after the power was turned off.

Additional electrical hazards are caused by the battery still being connected after serious vehicle damage. Static electricity can cause airbag deployment.

1.2.5 Mechanical hazards

Undeployed airbags are a mechanical/electrical hazard.
A number of police and firefighters have been injured by deployment subsequent to a collision. The device that explodes the airbag at a speed in excess of 300 kilometres is by design an explosive device. Airbags do not deploy in 30% of collisions. They can unexpectedly deploy any time after a collision. All airbags are to be treated as "live'" for at least 30 minutes after the collision, and, until deactivated by an expert. Loose pieces of debris from commercial vehicles can fall on rescue workers. Collapsible bumpers have been known explode in a fire, or suddenly release. Bumpers can compress, remain static, the suddenly decompress breaking the leg of someone standing next to it. The component parts of collapsible bumpers have been known explode in a fire, or suddenly release turning pieces of metal into a projectile. (*Short video available*)

1.2.6 Traffic conditions

Experienced traffic officers in motorized nations all drive cars or motorcycles. These officers are routinely familiar with the driving culture of speed, sightlines, visibility and stopping distances. This culturally acclimatises them to assess motorized vehicle traffic conditions in a way that none-drivers are not likely to accomplish as easily. This may require a special training programme in China with particular emphasis on sightlines and vehicle braking. The officer must be able to assess the traffic conditions properly for the safety of all. If traffic conditions cannot be properly assessed then it is more difficult for him to set up an outer perimeter for safety.

1.3 Scene Priorities

i) The first priority at the scene….. Protect life and property

The first life to preserve? ……..Your own

The protection of life is covered in detail in another training module.

ii) The second priority at the scene……. Preserve evidence

Evidence is perishable. In the developed nations there are three reasons to preserve evidence:

- To gather evidence to enable a successful prosecution of the person responsible for the crash
- To gather evidence to enable the victim to obtain financial compensation from the person responsible
- To gather accurate data for crash causes so that remedial action can be taken to prevent further crashes

iii) Perishable evidence

- Participants, drivers, passengers, cyclists, pedestrians, victims can all walk or be transported away
- Witnesses may leave the scene
- Skid marks – most have a slight shadow visible for a few minutes prior to the dark black rubber marks indicating locked wheels. The rubber marks along with the coefficient of friction of the surface can be used to calculate vehicle speed. Police skid testing reveals a "shadow" prior to full wheel lockup, that can disappear in as little as two or three minutes. Recording the "shadow" provides more accurate speed estimates.
- Road surface condition – frost, black ice, damp road surface, can disappear in minutes
- Other vehicle – this may leave the scene

- Position of objects – debris, clothing, fabric, shoes, personal property etc. may be moved by persons, wind, or movement of traffic.
- Mechanical condition – may be repaired or adjusted. It is not uncommon in developed nations for commercial drivers to adjust air brakes properly prior to arrival of police.
- Unusual lighting conditions- the position of the sun changes lighting conditions rapidly at dawn and dusk. A vehicle operator/pedestrian may be blinded by temporary lighting conditions.
- View obstructions – such as a large parked truck

1.4 Determine Perimeters

i) Access to be limited to emergency personnel only.

Pedestrians and vehicles will contaminate the scene. They may be at risk from crash hazards. By passers may pick up souvenirs that are crucial evidence. On occasions outright thefts may occur. Only trained professional personnel should be within this zone. That is Police, Fire, Ambulance or other necessary specialists.

ii) Provide perimeter barrier or verbally identify boundaries

Other road users will not know your directions unless they are conveyed clearly. In the early stages, in the absence of other emergency personnel, educated citizens may be delegated simple tasks to assist set up a perimeter. If this is a major crash scene, in the developed Nations the assistance of Highway engineering staff to erect physical barriers and warning lights may be required.

1.5 Perimeter Size

What is the effect of speed on perimeter size? Higher speeds require larger perimeter. The crash scene may take place in an area as little as 2 meters. On an expressway the sequence of events leaving trace evidence may be up to 1km, if very high speeds are involved.

In addition the scene safety factor requires a perimeter size that matches the surrounding speed limit, in order to give traffic time to slow down.

1.5.1 Determining Perimeters – Outer perimeter

Areas of approach – collisions occur because objects have motion and dissimilar direction. The areas of approach of all vehicles/persons are of interest to the collision investigator. The investigator has to determine the pre-collision sequence of events including, visibility, speed and timelines. The outer perimeter should include these areas.

1.5.2 Inner Perimeter

Area of impact – this area includes the immediate pre-collision area, the area of the collision itself including debris field, and the area of post collisions. This area is important for this is where most collision evidence will be found.

Movement to points of rest – this is the critical area in which injured victims will be found unless they have been moved.

1.6 Managing Short Lived Evidence – Your witnesses

Preserving crucial short lived evidence - ask "What happened here?" In ideal circumstances interview witnesses separately. Their evidence may be contaminated by others. If there are injured persons find out if someone has assessed his or her injuries. If a witness reports, "this person is having trouble breathing" that sets an urgent priority for immediate medical attention.

Obtain full contact information, address, telephone, work unit etc.

Witnesses can provide crucial information pertinent to full emergency response, example type of cargo carried by commercial vehicle, crucial information about victims medical condition.

1.7 First Steps After Securing the Scene

- Conduct a thorough Scene search for people. Whilst it is rare to lose vehicle occupants and crash victims in urban/city areas, this occurs in rural areas quite frequently. Two examples:

- Upon attendance at a severe head on collision in Delta officers found the driver unconscious behind the wheel. The passenger door was open. After several minutes delay an experienced officer examined the windshield to find a damage pattern consistent with a passenger being carried and not wearing a safety belt. The passenger door was open adjacent to a deep ditch filled with black water. There was no sign of a body. Police divers were called to and were about to commence a search, when it was fortunately revealed a passing motorist had transported the injured passenger to a hospital some distance away prior to police arrival. However, this person could just as easily have drowned in the ditch. Officers did not realize there was a passenger for several crucial minutes.

  In 1996 Washington State USA, officers attended a severe multiple fatality caused by a head on collision. The windshield glass was smashed. After several hours' investigation, the bodies and vehicles were transported away and the site cleaned up. The police then received a call from relatives asking, "where is the baby". They immediately returned to the scene, which was in a rural forested area. After a thorough search with no sign of the baby, the investigating officer shined his

flashlight up into the trees. He saw the baby impaled on a tree branch. The child had not been properly secured and had been ejected from the vehicle. (That officer is today an expert and child occupant restraints and trains police in the USA and Canada).

- The scene search must include a search of the interior of the car for indications of how many occupants there are. Occupants not wearing safety belts are often ejected at high speed. Under certain conditions doors can fly open and then close again in a split second.

Other basic steps

- Protect physical evidence from contamination
- At major incidents take photographs
- Locate and interview witnesses
- Complete field sketch

A field sketch is a rough sketch hand drawn at the scene. It is not a comprehensive document. A draught diagram of engineering quality can be produced later, provided a file sketch is done at the time. Best practices indicate that field sketches become standard practice at all injury collisions.

The search should locate significant pieces of debris. With the weight of an object and the distance away from the point of impact, laws of physics can be engaged to estimate vehicle speed.

1.8 Witness Statements

It is preferable for police to write statements on behalf of witnesses (assuming police are trained to do this). Witnesses may be illiterate, do not know the rules of evidence and will included irrelevant data such as their opinion or hearsay evidence. A trained police officer will extract the essential evidence from an untrained observer.

What do witnesses want to tell you? Quite often relevant information such as that one driver was speeding, or drunk, or disobeyed a traffic light.

Who called the emergency services? The telephone operator should be trained to take names. The person who called is often a key witness.

What happened after the collision? Positions of vehicles may be reversed; one collision may force another secondary collision on the opposite side of the road or elsewhere. Other relevant information may include who gave first aid or directed traffic.

What are police investigators most interested in? – What happened before the collision?

1.9 Interviewing crash participants

Basic Questions -

- *Were you the operator of this vehicle?* - At a Delta collision in 1990 a very large lady was found at a fresh collision behind the steering wheel, hands on the wheel. She was in apparent shock. She denied being the driver but offered no further explanation. After a few moments her husband appeared climbing up the side of a hill next to the crash scene, covered in dust. Neither was wearing a Safety belt. The side collision catapulted her across the front seats forcing her husband out of the door, across the highway shoulder and down the hill. He was the driver, not her.

- *Were you alone in the vehicle?* - Passengers not in a Safety belt, particularly children, are often ejected from the vehicle. A common triangular window sticker on the back of family cars in motorized countries reads, "Baby in the car".

- *Were you wearing a Safety belt?* Failure to wear a belt is now considered by civil courts to be a contributory factor to increased injury. An innocent person injured by the act of another will often get less financial compensation because they did not wear a safety belt.

- Also failure to wear a belt is often a contributory factor in loss of control of the vehicle. Drivers belted in have better vehicle control. In a tragic collision in British Columbia some years ago, a car struck a passenger bus. The first impact threw the driver off the seat. The bus then careened out of control down a hill striking other vehicles, causing death and injury. The initial impact was not very serious; a driver belted in could have regained control and applied the brakes. The final outcome was much more serious than it should have been.
- *Were you hurt in the collision?* All injuries are not immediately apparent. There can be subsequent medical events. 1988 a Delta officer attended a minor collision involving a BMW and a Mercedes, both driver in safety belts, no apparent injury. The officer could not communicate with the Mercedes driver, a Mandarin speaking female in her mid fifties. He saw she was holding her chest and called an emergency ambulance. She was having a stress-induced heart attack. This alert officer saved her life.

- The nature of the injuries should be determined verbally. An alert conscious person able to describe their injuries one moment, may shortly lapse into a state of being unconscious before the ambulance arrives.

- Other basic questions – *What happened, what direction were you traveling, how fast were you going?*

2. Stress and the Emergency Responder

2.1 Expanding knowledge of stress

In recent years there has been an increase in knowledge about the effects of stress. Stress is the effect on the body, mind or emotions of traumatic incidents or unusual pressure. It is an emotional or physical overload that is more than the body, mind or emotions can absorb or manage. Recognizing that stress exists and can be managed is an important tool for police managers. Failure to deal with stress will result in reduced performance from employees.

i) Stress can cause traffic crashes as vehicle operators under mental pressure commit apparently stupid acts:

- Stress causes drivers to lose their point of concentration, or their mental focus.
- Stress shortens our attention span, as the mind seeks relief.
- Stress can create a selective perception, emphasizing some facts, minimizing others.

ii) Traffic crashes cause stress – most often for the injured victims of a crash, but also for witnesses and for police officers required to frequently attend traumatic incidents.

Traumatic incident stress affects our perception or view of reality. It causes people to shorten their attention span. It causes them to have a selective perception of reality, of even events that have just occurred. It causes persons to adapt their perception of events and produce a survival strategy.

The effects of stress will distort the participant's view of reality in a major traumatic incident.

There are after-effects of stress on persons involved in a traumatic incident, or, a series of traumatic incidents. This is called Post Stress Reaction Syndrome. Long-term effects of stress are many, they include:

- Alcohol abuse
- Spousal abuse
- Mental illness
- Physical illness
- And even suicide.

iii) Emergency services workers

The effects of stress on police, fire and ambulance workers should be recognized. North American practice is to provide specialized training to police, fire and ambulance workers to cope with the effects of stress from traumatic incidents. Emergency services workers all have particular difficulty in handling fatalities and injuries involving children.

They have to deal with this during their work shift then go home to their families. The "macho" man concept that a real man can handle anything and carry on unaffected is 25 years out of date. For a major traffic collision involving fatalities and serious injuries a programme of basic stress management, and a higher-level programme called "Critical Incident Stress Management" should be initiated.

2.2 Critical Incident Stress Management

What is critical incident stress?

Dr. Jeffrey Mitchell, an authority on Critical Incidents stress, defines Critical Incident Stress as: Any situation faced by Emergency Services Personnel that causes them to experience unusually strong emotional reactions which have the potential to interfere with their ability at the scene or later, or generates unusually strong feelings in the emergency service workers**.**

There are several components to dealing effectively with stress including

i) Pre Incident Preparation;
ii) Defusing;
iii) Critical Incident Stress Debriefing;
iv) Individual Intervention;
v) Family Critical Incident Stress Management; and
vi) Follow-Up Referral;

i) Pre-incident preparation - Emergency response workers require training to recognize that stress is a likely effect of responding to injury or fatal crashes. The mental preparation is part of the process of coping. Unrealistic expectations along the lines that "tough cops don't cry" should be dispelled. Workers should be taught that certain reactions, such as sleeplessness are to be expected.

ii) Defusing – This is a minor debriefing. This process is typically a three-stage intervention.

It may be considered a shortened version of Critical Incident Stress Debriefing. The three steps are:

- Defusing to be implemented immediately, or within 8 hours of a traumatic event
- Shorter in length than a formal Critical Incident Stress Debriefing (i.e. One hour rather than two or three).
- More flexible than a formal Critical Incident Stress Debriefing, defusing can take place one on one. An experienced supervisor preferably not involved in the original incident, will take the officer for what is called a "walk & talk" and let him vent or verbally release his feelings about the

incident. A "defusing" is somewhat of a shortened version of a Critical Incident Debriefing. A defusing may eliminate the need for a full debriefing particularly in a lesser incident.

iii) Critical Incident Stress Debriefing – This is formally, a seven stage process used in a group meeting for those involved in a critical incident to help:

- Mitigate the psychological impact of a traumatic event.

- Prevent the subsequent development of a post-traumatic syndrome.

- Serve as an early identification mechanism for individuals who will require professional mental health follow-up.

- The debriefing is ideally held within hours of the incident. It may eliminate the need for a full debriefing.

Individual intervention – this is on an "as required" basis. An officer dealing with the investigation of the death of a 7-year-old boy on a bicycle, who has his own child of the same age who rides a bicycle, can be expected to suffer stress effects quite normally. This may require individual counselling.

iv) Family critical incident stress management – This is generally reserved for emergency personnel exposed to a major incident resulting in multiple deaths and/or injuries, or, may be required for an emergency worker exposed to a series of smaller incidents involving in death or injury. This programme provides training for family members who may not understand the trauma that their relative has experienced. This is a standard "best practice" for example in North America for police officers involved in shooting incidents. Case studies show that over half of these officers' marriages will fail within a few years. The right type of counselling can reduce or prevent these effects.

v) Follow up referral

Weeks or months later there should be follow up to see how the officer is managing. If necessary the officer can be referred for in-depth psychological counselling.

Stress management, and, critical incident stress management, are sophisticated programmes that require specialized training for application. Best practices are that all police supervisors should have training to apply basic "walk and talk" techniques to officers in their employ. In addition supervisors should know when to recognise the effects of stress on their subordinates and when and how to engage trained professional help to assist their subordinates members after they have dealt with incidents involving death and serious injury.

Apparently the MPS is organized into divisions with an "accident investigation division". If these officers routinely attend fatal and serious injury crashes as their primary responsibility measurable effects of stress can be expected. This may be coupled with undesirable behaviour such as: excess alcohol consumption, spousal abuse, and family break-up and possibly work related disciplinary problems.

3. Contingency Planning

3.1 Introduction

A contingency plan is prior preparation for a predicted emergency incident. Contingency plans assess and prepare for a threat or disaster such as fire, flood, earthquake, tornado, volcano, air crash, rail crash, bus crash etc. There are seven key areas to address:

i) Communication
ii) Transportation
iii) Rescue
iv) Medical Assistance
v) Evacuation
vi) Relief supplies
vii) Restoration/reconstruction

Some of these apply to traffic crashes.

Effective emergency response depends on advance planning. In the short term China cannot hope to emulate the developed nations resources to cope with major emergencies, and frequent traffic emergencies, particularly in rural areas. However China can develop "made in China" solutions that take advantage of existing resources and existing conditions, including the rural and undeveloped areas. A training plan for First Aid nationwide could be relatively inexpensive for example, and should result in immediate economic payback in reduced social costs. The community benefits of First Aid training also go far beyond dealing with injuries from traffic collisions.

By way of introduction to this topic we will quote recommendations from a report into Road Safety commissioned by the Asian Development Bank in March 1997. This report has emphasis on conditions in the Heilongjiang Province.

3.2 Heilongjiang Province Recommendations

There is evidence from motorized countries that with properly coordinated early rescue and retrieval systems, together with appropriate early trauma management, some 15% of road trauma deaths could be prevented. An ideal system would integrate the total management system from first respondent, through First Aid, ambulance transport and pre-hospital treatment, emergency hospital reception, into operating theatre services and other appropriate centralized trauma care,

Even with sophisticated management systems, the most important decisions bearing on the ultimate success of the overall care given will be taken early in the process:

- What location for ultimate treatment.

- Required speed of transport, and hence what method of transport. In addition evidence from the United States and Europe suggests that there are three major contributors to death in road trauma. The two pre-dominant physical causes are obstructed airways and shock (often associated with loss of blood). These two factors can not only lead to death, but can also make resuscitation more difficult and lead to longer term complications if allowed to persist for any length of time. Both these threats can be largely dealt with without the need for sophisticated training and/or equipment.

- The third major threat is delay. Delay can be associated with:

    - Arrival at the scene and notification of the collision to the appropriate authorities
    - Providing appropriate first aid
    - Waiting for transport and
    - Delivery to the correct hospital for the most appropriate treatment

Solutions in many motorized countries are centred on a range of sophisticated extremely expensive services including:

- Comprehensive emergency information systems to handle both ambulance, Dispatch and hospital allocations
- A number and range of ambulances to meet the demographic needs of the area and the potential trauma types
- Mobile paramedic services both in, and working in association with the ambulance fleet
- Highly specialized ambulance units (equipment levels, helicopters, fixed wing aircraft etc._ often with a doctor in a attendance and
- Specialized hospital trauma reception and treatment centres

It was obviously unlikely that Heilongjiang resources would be able to provide such complex support infrastructures.

It was difficult to arrange meetings with the emergency services in Heilongjiang. The traffic police provided the information on which the following observations are made.

There is only a rudimentary ambulance system available in the Province, used mainly for patient transfer. Similarly, there is no special infrastructure to assist with the removal of injured occupants from crushed vehicles, the traffic police deal with this as best they can. There is no effective emergency dispatch system that the traffic police believe would make it viable to summon an ambulance and await its arrival at the site of a serious road

accident. The Traffic Police therefore adopt an informal method of patient transfer. If a driver or vehicle involved in the accident us still able to do so, they are asked where appropriate, to transport any injured to hospital. If such transport is not available, the Traffic Police can stop a passing motorist and ask them to assist. If neither of these options is available, or the injuries do not allow it, the Traffic Police themselves usually provide the transport, as necessary.

This might at first seem an extremely ad-hoc system. However, given the resources available, there is evidence to suggest it is a viable approach. If the major causes of death are administered to by Police at the accident site, and then the patient is transported promptly to Hospital, many of the key requirements to avoid death previously outlined have been addressed. The process very much coincides with a "formal" system being promoted in motorized countries, called "Scoop and run". In order for the system be as effective as possible the Province would need to ensure the following:

- There is a well publicized free emergency telephone number to allow assistance to be summoned

- Appropriate, targeted first aid training is provided for traffic police and anyone else likely to be early on the scene of road accidents and

- A method of determining an appropriate hospital and ensuring a timely arrival

Until such time as more resources can be found to develop a more sophisticated, but still appropriate ambulance system, the concepts of Scoop and run procedures should be developed to maximize their effectiveness within the current Province structures.

RECOMMENDATION: it is recommended that, until additional resources are available to establish a conventional ambulance system, the Province continue to use and refine their Scoop and run type emergency operation.

This concludes the 1997 Heilongjiang recommendations.

3.3 General Approaches to Planning

There is no question that with China's traditions of education and training there are ample intellectual resources to organize and develop a "Made In China" response to planning for response to matters such as traffic crashes. Most less developed Nations are not so fortunate. Roadblocks to release of stimulated discussion about problem solving can often be found in Nations where a strong central Government is held responsible by citizens to take care of them from the cradle to the grave. This may stifle local initiative and be the first obstacle. National planning is not required to deal with a traffic crash; the central Government has other priorities to take care of.

It is not an accident that the best models of emergency response are found in those Nations where this is a local responsibility. Other less educated Nations may require

outside assistance to develop contingency planning. This is not the case in China. The first element of planning is to get local experts working together with the resources that they have available, in that locality and in context of local culture and practice. The simple elements of local planning are to have it sponsored by the City, County or Provincial Government and then put the best local brains together in one room to work out the problem.

There are many models to look to as an example. In the next training module we will be looking at the responsibilities of Police, Fire, Ambulance, Highway maintenance, Tow trucks and citizens.

The United States organises it's emergency response to traffic crashes on a County or City level. The City of Los Angeles has a long tradition of rapid, effective, sophisticated emergency response using highly trained professionals. This City is large enough and the population density is such that it can afford a helicopter ambulance response for the worst cases. Los Angeles has set a precedent for the rest of the United States. This is as good as emergency response get anywhere in the world. Less densely populated and poorer areas of the United States have to compromise on quality, but not usually by very much. The ambulance service is privatized in many jurisdictions and the service is paid for by the individual or by the vehicle insurer.

A community emergency response team may be called out to a major traffic crash. Throughout the developed world there are many models of Community emergency response teams made up mostly of volunteers and every one is different.

a) Brevard County, Florida

This County has an organized Community Emergency Response Team of citizen volunteers. It is linked to a State emergency response communications centre. A primary interest of the County Team is Hurricanes; the next priority is forest fires.

The County has adopted a Florida State sponsored curriculum to train citizens in such topics as hazard awareness, disaster fire suppression, disaster medical operations, light search & rescue and team operations. These skills can be of benefit at the scene of a traffic crash.

b) Insurance Corporation of British Columbia

This Corporation has 5,500 employees and is one of the largest vehicle insurers in North America. It has sponsored a corporate plan to train a percentage of its employees to function properly in a disaster. The primary focus is emergency response to earthquake. However each one of the Corporations 1,000 vehicles is equipped with a basic first aid kit. Whilst the training programme is basic, the skills learned by volunteer staff can be applied to a traffic emergency.

There are at least 1,000 other variations on the theme of readying volunteers for disasters including traffic crashes. Few focus on traffic crashes, although there is an example in the next training module from Sicamous British Columbia.

In general however overall contingency planning for emergency response is rolled into Disaster planning and is not specific to traffic crashes.

Planning for traffic crashes is generally left to professional emergency services.

3.4 Planning Specific to Crash Response

As mentioned in the Heilongjiang report key issues for planning are:

i) Improved, faster communications
ii) Improved life saving skills for First responder
iii) Improved transportation of injured persons
iv) More sophisticated hospital response – In larger Cities in the developed nations certain hospitals specialize in different types of trauma treatment. E.g. Every police officer, fire fighter, ambulance attendant and radio dispatcher in the 2 million population area pf Greater Vancouver Canada knows that the Royal Columbian Hospital specializes in head injuries and has specialized equipment and trained staff for this purpose.

To the above list we will add:

v) Improved rescue equipment and training in use of such equipment.

3.5 Training

The value of planning for enhanced and ongoing training cannot be emphasized enough. A plan is meaningless if officers don't have training to implement the plan.

On a simple level the Metropolitan Police of England have First Aid teams who compete against one another for awards in simulated incidents. In the best practice jurisdictions, all the professional emergency response services train together at least once a year on simulated disasters. Recent examples of coordinated training from the Pacific Northwest of the US & Canada are simulated:

- Plane crash
- Bus crash
- Train crash
- Train/Bus crash
- Passenger ferry crash

These simulations are mostly not specific to collisions involving perhaps less than five injured people. However the experience of working together, communicating together,

and understanding each agencies priorities, are invaluable, when these agencies work together on smaller emergencies such as a collision.

Examples of conflicting priorities:

The Fire Dept. will invariably stop all the traffic until they are finished. They have no concern with continued traffic flow, which is a hazard or nuisance to them.
The ambulance service will interrupt a police officer interviewing a person with a minor injury and ask the officer to get the facts of the crash causes later.

The Fire Department, if not adequately trained, will flush away crucial evidence left on the road surface.

The police may wish to get traffic moving, in a way that puts other emergency workers at risk.

A basic principle of training is this: the way you train will be the way you respond. If the training is inadequate the response will be inadequate.

4. Evaluation Process

Contingency planning requires an evaluation process. The process will identify and separate each individual component in response to a collision. It will then assess each component and see how it can be improved. Included in the evaluation there must be an evaluation of the command structure. The evaluation must objectively and without prejudice deal with deficiencies in the command structure so that they can be rectified.

For example, some police officers in undeveloped Nations are not trained in the timelines surrounding a medical emergency. As a result injured victims will die due to delay. This is not a failure of the officer. It is a failure of the command structure to provide the officer with crucial training.

5. Collision Investigation

5.1 Introduction

The English speaking Nations together with much of Europe have greatly advanced the science of collision investigation. This is much more sophisticated today than it was 20 years ago. Crash investigation is well recognised as an advanced speciality within traffic policing.

Training for police collision investigators is generally seen at four levels, with a fifth being added for investigators who have an engineering degree from a recognised University. These may either civilian or police.

In basic (none traffic) police training, police recruits typically receive two to five days training in basic crash investigation. This is called Level 1. The next level of training is Level 11.

5.2 Level II Crash Investigation

Level 11 is the basic crash investigation training for all professional traffic officers. The successful investigation of a collision requires a police officer to possess certain technical skills. The Level 11 training course is discussed as follows. The training is designed to ensure that police officers have the required knowledge to conduct successful collision investigations.

5.3 Selection Criteria

Level 11 training is required for police officers who:

- Possess relevant investigative experience
- Are involved in collision investigation as part of their daily responsibility
- Have completed a Level 1 training course previously.

5.4 Course Objectives

Graduates of the Level 11 training course should be able to:

- Manage a collision scene
- Apply the series of events to a collision investigation
- Calculate road surface friction by three methods
- Identify, measure and calculate a minimum speed from slide to stop tire marks
- Identify, measure and calculate a speed from tire yaw marks
- Perform calculations with velocity, distance and time
- Measure and diagram a collision scene
- Photograph a collision scene by day or night lighting
- Examine an automotive lamp for indications of illumination at the time of the collision
- Identify and interpret physical evidence at a collision scene
- Prepare an evidentiary report

In order to graduate from the course participants must:

- Attend lectures, make notes
- Participate in practical field exercises
- Engage in class discussion
- Pass a written examination
- Pass a practical examination
- Work as part of a team (or syndicate)
- Prepare a verbal evidentiary report

The training course does not teach interviewing techniques, or the taking of witness statements. This skill is provided for in other basic training, which the officer will have taken previously.

5.5 Speed

Speed is the most common factor in the severity of collision and any resulting death or injury. Particular attention is paid in the training to establish speed, and speed is used as an example of one component of the training.
During the training participants will be required to:

- Determine the coefficient of friction using a drag sled
- Determine the coefficient of friction using a shot marker
- Determine the coefficient of friction using an electronic accelerometer
- Compare calculated coefficients using published tables
- Measure stopping distance from shot marker when speed is known from radar. Calculate a minimum speed from measurements
- Measure and record visible slide to stop mark versus actual stopping distance
- Calculate a minimum speed from a test across multiple road surface types
- Calculate a stopping distance using calculated coefficient of friction
- Examine road surface marks created by various stopping tests, and evidence on tires
- Measure, record and calculate a speed from a yaw test when radar speed is not provided
- Examine road surface marks and tires after yaw tests

5.6 Conclusion

The Level 11 training illustrates the police competency level that should be applied in best practice jurisdictions, to the investigation of any injury causing collision.

Above this level, where there is death, or, serious life threatening or crippling injury, the attending police officers should be trained to Level 11 or Level IV. Each level requires an additional three weeks training, with performance expectations to a much higher standard than Level 11. Level 111 and Level IV qualify the officers as experts for court purposes, particularly in the skill of reconstructing vehicle speeds.