

Safer Vehicles Safer Drivers

Report for

**EMERGENCY SERVICES
FOUNDATION
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Safer Vehicles – Safer Drivers

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Disclaimer:

The comments in this report are those of the author and are based upon discussions at the various organisations or taken from written or electronic material directly or indirectly obtained before, during or after the study tour period.

Clarification of information in this report should be checked directly from the organisation concerned to ensure facts are correct in relation to any decisions that may be made or quoted based upon information in this report.

CONTENTS

1. Executive Summary
2. Emergency Services Foundation
3. Introduction
4. Objectives
5. Organisations Visited
6. Organisations Overview
7. Vehicles – General
 - 7.1 Introduction
 - 7.2 Standards
 - 7.3 Cab chassis
 - 7.4 Engines
 - 7.5 Transmissions
 - 7.6 Tyres
 - 7.7 Safety systems
 - 7.8 Dealing with manufacturers
 - 7.9 Custom built models
 - 7.10 Vehicle bodies
 - 7.11 Production process
8. Vehicles – Specific
 - 8.1 Compact pumpers
 - 8.2 Wildfire vehicles
 - 8.3 Aerial appliances
 - 8.4 Chemical, Biological, Nuclear and Radiation (CBNR)
 - 8.5 Incident control / command
 - 8.6 Special ambulance
 - 8.7 Rail rescue
 - 8.8 Small ladder
 - 8.9 Mobile positive pressure ventilation (PPV) fan
 - 8.10 Rural tanker
 - 8.11 Platforms on demand (PODS)
9. Pumping
 - 9.1 General
 - 9.2 Compressed air foam systems (CAFS)
 - 9.3 Hose reels

Safer Vehicles – Safer Drivers

- 10. Driving
 - 10.1 General
 - 10.2 Vehicle control
 - 10.3 Driver education programs
 - 10.4 Driving simulators
 - 10.5 Driving aides
 - 10.6 Lights and siren training
 - 10.7 Driving policies
 - 10.8 Volunteer Fireman's Insurance Services (VFIS)

- 11. Safety / Environmental
 - 11.1 Seat belts
 - 11.2 Ladder gantries
 - 11.3 Exhaust systems
 - 11.4 Vehicle steps

- 12. Acknowledgements

1. Executive Summary

Background:

This report details findings from a study tour undertaken during 2007 by Glenn Jennings of the Country Fire Authority (CFA) Victoria. The study tour was funded by the Victorian Emergency Services Foundation.

Purpose:

The purpose of the study tour was to investigate; research and report on the experience and current directions of organisations that relate to aspects of emergency vehicle operations and response, especially heavy vehicles.

Key Finding / Conclusions:

1. The study tour has provided the author, CFA and other Emergency Service Organisations (ESO's) with invaluable knowledge and information. This will be used to ensure that emergency vehicles are designed, manufactured and used in accordance with best practices available within Australia.
2. Driver education for all ESO personnel should be mandatory and assessed to national competency standards.
3. Australian ESO's need to have closer relationships with overseas manufacturers to ensure that "we get what we want, not what the local distributors want us to have or believe what we require".
4. ESO's should purchase "dedicated purpose built vehicles" for emergency response use. Several manufacturers provide vehicles designed by and for fire and emergency services.
5. Fire services should develop and approve policy/s in relation to the use of hose reels for structural firefighting. The use of hose reels for internal structural or vehicle fires must be seriously researched and procedures developed to limit their use depending upon flow rates.
6. The culture of not wearing seatbelts is a major issue for all fire services around the world and must be addressed immediately.
7. ESO's should investigate all vehicle collisions and implement changes to work practices and vehicle design as appropriate.
8. ESO's need to be more pro-active in purchasing vehicles with the latest safety systems, especially in transport vehicles.
9. The use of driver monitoring devices is becoming standard in Europe and North America and provides many benefits.
10. ESO's should develop and approve national specifications for all emergency vehicles, especially in relation to safety systems.

Safer Vehicles – Safer Drivers

11. Fire services need to conduct further testing on the suitability of air bag suspensions for emergency response use.
12. For vehicles fitted with air bag suspensions on both axles, serious consideration must be given to ordering cushion springs on cabs and static seats for the driver.
13. Several ESO's visited were impressed with vehicle testing and collision investigation processes currently undertaken by CFA and other Australian ESO's.
14. The use of driving simulators was widely discussed within Europe and North America with varying views as to their benefits. It was noted that static units have less electronic faults than mobile units. They are expensive; generally only provide one and one training and not suitable for all people due to motion sickness.
15. ESO's should consider fitting additional siren speakers at angles between 30 and 45 degrees off centre to provide greater direction of sound.

2. Emergency Services Foundation

After the 1983 Ash Wednesday bushfires, a public appeal was launched to provide relief to Emergency Service Workers affected by this tragic event.

With the agreement of the originators of the appeal, the residual funds were used to form a charitable trust for the benefit of Emergency Service Workers.

In 1987 the Emergency Services Foundation (ESF) was established and in line with the origins of the Trust, it was determined that provisions of the Trust Deed be directed towards:

- ❖ the relief and assistance to any Victorian Emergency Service Worker and their families who suffer hardship as a result of the worker engaged in the operations of activities of an Emergency Service; and
- ❖ the funding of research and study by properly qualified persons aimed at the improvement of the methods of relief and assistance set out or the lessening of hazards experienced by Victorian Emergency Service Workers in their line of duty.

Since 1987 a number of Victorian Emergency Service Workers have received financial assistance and in some cases the families of the deceased have also received financial support.

In excess of 70 Scholarships have been provided to members of the Victorian Emergency Services and these are allocated on an annual basis on the recommendation of the Head of the Agency concerned with the nominations.

I undertook my study tour as a 2007 Scholarship winner and I am extremely thankful to the Foundation for the opportunity.

For further information relating to the Emergency Services Foundation, please check the web site at – www.esf.com.au

3. Introduction

Emergency vehicle design and operation is critical to the effective and safe response of all emergency services.

This report details information gained from a study tour to Europe and North America to investigate, research and report on the experience and current directions of organisations that relate to aspects of emergency vehicle operations and response, especially heavy vehicles. This study tour was undertaken with a view to support and improve current practices both here in Victoria and across Australia.

Knowledge gained and the long term value and power of networking will provide the structure and support for future decisions in relation to ensuring safer vehicles and safer drivers. Implementation of policies that improve and support the operational response capabilities of the Country Fire Authority (CFA) and other ESO's will provide safer workplaces and communities. Whilst the majority of this report relates to firefighting vehicles, there are many issues that are relevant to all ESO's in Australia and worldwide.

4. Objectives

The objectives of the study tour were to:

- 1. Investigate and make recommendations in relation to the future operational use and applicability of heavy vehicles, their safety features and the benefits for emergency response.**
- 2. Research specific design features of firefighting vehicles, particularly safety, security and ergonomic accessibility for all aspects of the vehicles operation.**
- 3. Review, analyse and evaluate driver education programs to investigate their cost effectiveness and their potential application for CFA and other ESO training programs.**

5. Organisations Visited

My proposal to the Emergency Services Foundation was to visit the following organisations that I had identified as being able to assist in achieving my objectives.

- ❖ Berlin Fire Brigade
- ❖ Calfire (California Department of Forestry)
- ❖ Fire Rescue Conference & Vehicle Expo
- ❖ Frankfurt Fire Brigade
- ❖ London Fire Brigade
- ❖ London Metropolitan Police
- ❖ Montgomery County Fire Department
- ❖ Rosenbauer
- ❖ Scania Trucks

In addition, CFA and myself were keen to maximise this opportunity and additional funding was approved to visit the following organisations.

- ❖ Bronto Skylift
- ❖ Fairfax City Fire Department
- ❖ Fairfax County Fire Department
- ❖ Los Angeles County Fire Department
- ❖ Metz Ladders
- ❖ Stockholm Fire Department
- ❖ Volunteer Fireman's Insurance Services (VFIS)
- ❖ Washington DC Fire Department

During my trip, I also visited the following Fire Departments. These visits were impromptu and were during my free time in North America.

- ❖ Big Bear Lake (California) Fire Department
- ❖ Las Vegas Fire Department
- ❖ North Vancouver Fire Department
- ❖ San Diego Fire Department

NOTE: This report is all encompassing and includes reference to all organisations visited irrespective of whether they were part of the ESF funded tour.

6. Organisations - Overview

Berlin Fire Brigade

Berlin Fire Brigade has approximately 6500 firefighters who protect its 3.5 million inhabitants. These firefighters operate out of 79 fire stations and 14 ambulance garages. The Fire Brigade is responsible for all emergencies in the City except those requiring attendance by Police. The Fire Brigade has a combination of both career staff and volunteers. Volunteers who commit for a period of at least six years are exempt from military conscription.

Big Bear Lake (California) Fire Department

Big Bear Lake Fire Department is located in California, 160 kilometres northeast of Los Angeles and protects approximately nine square miles. This includes the City of Big Bear Lake and adjacent Forest Service lands encompassing Forest Service leased cabins. It provides fire and EMS services and averages 4 - 5 call per day.

Bronto Skylift

Bronto Skylift, situated in Finland, is one of the leading manufacturers of hydraulic platforms. Bronto Skylift operates under an American public liability company, Federal Signal Corporation. Bronto specialises in Aerial Ladder Platforms and Hydraulic Platforms and produce models for both fire services and commercial applications. Bronto Skylift has two facilities in Finland: Tampere and Pori. The headquarters is situated in Tampere, and the manufacturing facilities in Pori. Bronto Skylift units have been delivered to over 110 countries in all continents.

Calfire (California Department of Forestry)

California Department of Forestry and Fire Protection (CAL FIRE) is responsible for the fire protection and stewardship of over 31 million acres of California's privately-owned wild-lands. In addition, the Department provides varied emergency services in 36 of the State's 58 counties via contracts with local governments.

The Department's firefighters, fire engines, and aircraft respond to an average of more than 5,600 wild-land fires each year. Those fires burn more than 172,000 acres annually.

Beyond its wild-land fire fighting role, CAL FIRE responds to more than 300,000 other emergencies each year. The Department also responds to medical aids; hazardous material spills; swift-water rescues; search and rescue missions; civil disturbances; train wrecks; floods and earthquakes.

Fairfax City Fire Department

The City of Fairfax Fire Department is a combined career/volunteer organisation that provides fire suppression and emergency medical services (EMS) to the over 22,000 residents of the City of Fairfax as well as first due to a 14 square mile area of Fairfax County.

The Fairfax City Fire Department operates out of two stations which are surrounded by Fairfax County. The department annually responds to over 11,000 incidents, an average of over 30 responses per day.

The department has an operational field strength of 60 career members on three shifts and work 24 hour shifts over a 56 hour work week. The department is the process of phasing in 4-person staffing on the suppression units. The EMS transport units are staffed with 2 fire medics.

Fairfax County Fire Department

The Fairfax County Fire and Rescue (FCFR) Department was established in 1949. It is a combination career and volunteer organisation providing fire suppression, emergency medical, technical rescue, fire prevention and educational services to more than one million citizens. Fairfax County encompasses 395 square miles of urban and suburban development, 10 miles west of Washington, D.C.

There are 12 active volunteer fire departments in Fairfax County. Volunteers are active operationally as well as administratively - with nearly 300 volunteer personnel available to provide supplemental staffing for fire and rescue services.

FCFR is one of the most highly funded departments (per capita) in the nation, and is able to supply its employees with the most advanced technology available.

Each year the department receives over 30,000 employment applications. The recruitment process is highly competitive and often takes over a year to complete all the necessary steps.

FCFR also sponsors one of the nation's Urban Search and Rescue (USAR) response teams. Code-named "Virginia Task Force 1," the team is rostered by approximately 200 specially trained career and volunteer fire and rescue personnel, with expertise in the rescue of victims from collapsed structures, following a natural or man-made catastrophic event. The team is composed of emergency managers and planners, physicians and paramedics and includes specialists in the fields of structural engineering, heavy rigging, collapse rescue, logistics, hazardous materials, communications, canine operations, and technical search.

Fire Rescue Conference & Vehicle Expo

Fire Rescue Conference and Vehicle Expo's were conducted each year by the International Association of Fire Chiefs (IAFC) in Las Vegas. Due to poor attendance and lack of interest from manufacturers, last years event was the last. I only attended the vehicle expo, however I obtained contacts and information which more than justified the decision to attend the expo.

Frankfurt Fire Brigade

The Frankfurt Fire Brigade operates seven fire stations and a number of field stations in which more than 900 firefighters work daily. In addition to these are 28 voluntary fire brigades, the Frankfurt airport brigade and four additional brigades located on industrial sites.

Of all the Fire Brigades / Departments that I visited on this trip and on previous trips that I have undertaken, I have never seen such an array of diverse firefighting equipment and vehicles. The main fire station had 67 engine bays and all except two had a vehicle or pieces of equipment in them.

Las Vegas Fire Department

Las Vegas Fire Department is located in the centre of Clark County Nevada. The City of Las Vegas covers 131 square miles with approximately 576,000 people. It is estimated that approximately 5,000 people move to the Las Vegas Valley each month. It is one of the fastest growing cities and Fire Departments in the USA. In the past five years, the Fire Department has nearly doubled its workforce and opened five new fire stations. The department consists of 648 employees, 64 pieces of equipment, operating out of 16 fire stations.

London Fire Brigade

The London Fire Brigade is run by the London Fire and Emergency Planning Authority (LFEPA). They are the third largest firefighting organisation in the world, protecting people and property from fire within the 1587 square kilometres of Greater London which has a resident population of 7 million, increased by another 500,000 during working hours.

London Metropolitan Police

The Metropolitan Police Service is famed around the world and has a unique place in the history of policing. It is by far the largest of the police services that operate in greater London (the others include the City of London Police and the British Transport Police).

Today, the Metropolitan Police Service employs 31,141 officers, 13,661 police staff, 414 traffic wardens and 2,106 Police Community Support Officers (PCSOs). It covers an area of 620 square miles and a population of 7.2million.

Los Angeles County Fire Department

The Los Angeles County Fire Department (LACoFD) serves unincorporated parts of Los Angeles County, as well as 58 cities and towns that choose to have the county provide fire and EMS services.

LACoFD has 165 Stations which house Engines, Quints, Paramedic Squads, Water Tenders, Patrols as well as Hazardous Materials Squads and USAR Units.

The department does not transport patients in ground ambulances. Rather, county paramedics provide treatment while privately contracted ambulances provide transportation to the hospital. Patients are carried in the department's helicopters, however.

The department operates some unique units including the Sikorsky S-70A Fire Hawk and the Bell 412, part of their Air Operations Section.

Metz Ladders

Metz Aerials became a member of the Rosenbauer Group in 1998. Metz Aerials is the competence centre for aerial rescue devices in the Rosenbauer group. At their Karlsruhe facility, the staff of 210 employees produce aerial ladders and hydraulic platforms for fire-fighting services all over the world. Continuous development and optimisation of their products have given Metz its reputation as a global leader in the aerial rescue industry.

Montgomery County Fire and Rescue Service

The Montgomery County Fire and Rescue Service (MCFRS) is a full spectrum life safety agency protecting about 500 square miles and nearly 1 million people who live and work in Maryland's most populous jurisdiction. MCFRS is a combination system (career/volunteer) in the suburban Washington, D.C. area, operating with an annual budget of about \$200 million dollars. The MCFRS annually handles about 100,000 emergency calls for service and is staffed by nearly 1300 career uniformed personnel and professional civilian staff and an equal number of volunteers, nearly half of whom are actively involved in emergency response.

In the last year, Montgomery County has been recognised in many ways including the recognition of several individuals from Montgomery County Fire and Rescue Service. Acknowledged for their outstanding contributions to the national fire service were Battalion Chief John Tippet, 'Fire Instructor of the Year' by the International Society of Fire Department Instructors and Assistant Chief Denise Rankin-Pouget, 'Safety Officer of the Year' by the International Association of Fire Chiefs and Fire Department Safety Officers Association.

North Vancouver Fire Department

The District of North Vancouver is situated on the North Shore of Vancouver Harbour from the Capilano River to Indian Arm. Within its boundaries there is a mix of residential, commercial, heavy industrial, and waterfront properties. Currently the District of North Vancouver Fire and Rescue Services provide protection and service to the 85,000 residents of the District of North Vancouver with five 1st line pumpers, one snorkel, one support vehicle, one rescue van, a command vehicle, a Haz-Mat Unit, a Fireboat and one hundred and forty three professional firefighters (126 suppression and 17 support).

Rosenbauer

Rosenbauer was founded in 1866 in Linz, Austria. As the second largest manufacturer of fire service vehicles worldwide, Rosenbauer delivers state-of-the-art vehicles and components – including pumps, foam systems, turrets and fire fighting equipment. The company has a staff of more than 1400 employees, and has production facilities in Austria, Germany, Spain, Singapore, the United States and China, as well as sales and service representatives in more than 100 countries.

San Diego Fire Department

San Diego Fire Department serves the eighth largest city in the United States and the second largest city in California with an area of 331 sq miles and a population of 1.3 million people. San Diego Fire-Rescue Department is a multi-faceted organisation that provides city residents with fire and life saving services including fire protection, emergency medical services and lifeguard protection at San Diego beaches. This protection is offered from 46 fire stations and 9 lifeguard stations who respond to approximately 90 000 incidents per year.

Scania Trucks

Scania is a leading manufacturer of heavy trucks and buses as well as industrial and marine engines. It also markets and sells a broad range of service-related products and finance services. Scania operates in about 100 countries and has more than 30,000 employees.

Scania was established in 1891 and is headquartered in Sodertalje in Sweden, about 30km south of Stockholm. In 2006 Scania delivered 65,000 vehicles.

Scania develops, manufactures and distributes trucks with a gross vehicle weight of more than 16 tonnes intended for long distance haulage, regional and local distribution of goods as well as construction haulage.

Stockholm Fire Department

Stockholm Fire Department is responsible for the fire protection of the City of Stockholm. It has 10 full time-manned and 1 daytime-manned fire stations. There are a total of 66 firefighters on duty at any one time and a total workforce of 550 employees. The Fire Department controls one of the most advanced alarm and control centres in the world. It is built into rock, 30 metres below Johannes Fire Station and answers emergency calls for fire, rescue, police, medical and ambulance, sea rescue, information on poisons, dental service and church crisis counselling – the only service of its kind within the European Union.

Volunteer Fireman's Insurance Services (VFIS)

VFIS® is a division of the Glatfelter Insurance Group. They are the largest provider of insurance, education and consulting services to Emergency Service Organisations. With over 15,000 clients in the United States and Canada, they have a long history of helping the Emergency Service Community to protect their assets and manage the many risks that they face.

Their continued commitment is to provide the most financially secure insurance products, as well as the risk management services necessary to protect their property, manage their responsibility to others and especially to protect the life and well-being of those that they serve. From the very beginning, VFIS has had a strong commitment to education, training and management consulting as part of their efforts to help the Emergency Service community.

Washington DC Fire Department

The District of Columbia Fire and Emergency Medical Services Department (FEMS) is an all-hazards agency providing emergency medical care and transportation (EMS), fire prevention, fire suppression, hazardous material response, and technical rescue services to residents and visitors in the District of Columbia.

FEMS resources are deployed from 33 neighbourhood fire stations and include 37 EMS transport units, 33 engine companies, 16 ladder trucks, three heavy-rescue squads, one hazardous materials unit, and one fire boat company. 17 of these transport units and 19 of these engine companies are staffed by paramedics providing advanced life support (ALS) care. FEMS responds to over 150,000 incidents a year, an average of 421 a day. FEMS also provides protection for special events that are unique to the nation's capital, such as major demonstrations and the Presidential Inauguration. In addition, FEMS provides fire and medical protection for Presidential motorcades and helicopter landings.

7. Vehicles - General

7.1 Introduction

Irrespective of the roles and responsibilities of each emergency service, they all have one common factor. That is, they all use vehicles in some form or another to provide transport for personnel or to carry equipment to a community call for assistance.

This section on vehicles will primarily focus on European built vehicles as their cab chassis along with Japanese vehicles dominate the Australian heavy vehicle market, especially those suited for emergency service use. It focuses on firefighting vehicles; however the principles can be applied equally to other vehicles used by all ESO's.

European Union (EU) requires that all vehicle contracts over €200,000 goes to tender. It also requires that the most expensive component, normally the body, be tendered first. The successful body builder then advises which cab chassis/s is suitable for their body and then that tender is sought. Purchasers may not have the option of buying their preferred cab chassis under this process. This process may not allow fire brigades to have total say over what they purchase, however they do have standard vehicles meeting a European standard.

Northern American, especially firefighting, vehicles have many advanced safety features, however these vehicle are designed and manufactured solely as firefighting vehicles. The firefighting vehicle market is experiencing major change at the moment as some of the largest and most respected manufacturers have closed or been brought out in recent years. Many fire departments have been caught out by the closure of these companies leaving them without vehicles and financially out of pocket.

7.2 Standards

Throughout Europe; firefighting vehicles are designed and manufactured in accordance with EN 1846. Pumpers in particular, all had identical bodies with only the stowage being different. Pumpers tended to have all firefighting equipment on the near side and technical and specialist equipment on the off side.

In North America, there are no mandatory standards, however the majority of firefighting vehicles are designed and manufactured in accordance with the following National Fire Protection Association (NFPA) standards. These being NFPA 1901 - Appliances and NFPA - 1906 Wildfire. These standards are widely regarded and referred to for investigative and coronial purposes. They are very descriptive and have been primarily written for vehicles designed from the ground up. Many of the requirements, such as Anti-lock Braking Systems (ABS) and Electronic Stability Programs (ESP) that have been standard for many years are not yet available in cab chassis available in Australia.

7.3 Cab chassis

General:

Throughout the organisations that I visited in Europe, I had the opportunity to observe several different types of cab chassis's. The more popular vehicles were Mack, MAN, Mercedes, Scania and Volvo.

For urban applications, Mercedes, Scania and Volvo were the most popular; whilst MAN was dominate for rural applications. Many of the models seen would be suitable for Australian use, however many of these are not available from our local dealers.

For the past twenty years, we in Australia have primarily used Japanese built vehicles. Hino and Isuzu have two and four wheel drive cab chassis that generally meet our requirements and are very competitive in cost. Within the fire services, a growing trend at the moment is a move towards European vehicles, especially for urban applications. Scania and Mercedes are being used for Pumpers, Aerial and Specialist appliances. Due to their cost and the number of vehicles required, several fire services are continuing to purchase Hino and Isuzu cab chassis for emergency service applications.

Air Systems:

The introduction of Scania and Mercedes, etc into fire service fleets has also introduced us to air systems for seats, cabins and suspensions. Each system has an important part to play in providing driver comfort and vehicle safety.

Rollover testing of several CFA aerial appliances has highlighted the advantages and disadvantages of these systems. The majority of fire services in both Europe and North America only specify air bag suspension systems on the rear axle only. Several will not specify them at all. This allows for the driver to 'feel' the road and drive accordingly.

I am aware of one manufacturer who does not recommend air bag suspensions for fire appliances at all. However they will become common as at least the rear axle requires air bag suspension for Electronic Stability Control to work.

In relation to driver seats, it is normal practice for electrically operated static or spring adjusted seats to be used. For cabins, it was normal to see cushion springs in place of air systems.

The combination of an electric spring adjusted seat, cushion cabin and leaf or coil spring arrangements on the front axle all provide the driver with 'feel' in the front end. Scania recommend this combination for all vehicles used as emergency vehicles.

Based upon the discussions within Europe and North America, and the results of CFA testing, I believe that further testing and evaluation of these systems is required.

Crew Cabs:

During my visit to Rosenbauer, I noticed that the majority of firefighting vehicles were based upon a single cab. The reasons quoted were: -

- There are more cab chassis options available in single cabs
- Most crew cabs are two single cabs welded together which produces problems as the vehicle ages. The Scania crew cab is now built as a dedicated crew cab and not joint as in previous models.
- It is generally cheaper to incorporate a second row of seats into the firefighting body than to purchase dedicated crew cabs. This option also allows the body builder to provide a larger rear cabin area than conventional crew cabs that can be restrictive at times.



Pumper – Frankfurt Fire Brigade

Low Profile Cabs:

New Euro 4 & 5 emission requirements have led to new engine technology. Certain engines require larger cabins in heavy vehicle trucks to accommodate larger radiators required for cooling purposes. This increase in height may not be a great factor in long haul trucking, however for emergency vehicle response use, they present many considerations. A higher cab with a greater centre of gravity presents many problems, especially with aerial appliances (ladders, hydraulic platforms, etc)

The Mercedes Econic is a low profile cab especially suitable for aerial appliances. The majority of aerial appliances (Ladders and Ladder Platforms) in Europe were on the Econic cab chassis. Unfortunately, this cab chassis is not available in Australia. Our challenge is to convince Mercedes that there is sufficient usage in Australia to warrant the investment in bringing them to Australia.



The author inspecting a Metz Ladder based on an Econic cab chassis

Rear Steer:

Rear steer chassis were very popular in Europe and starting to be introduced into North America. These vehicles feature rear steer tag axles, generally fitted with super single tyres. This allows for the weight carrying capacity of three axle vehicles, however provides turning circles similar to two axle vehicles.



7.4 Engines

General:

Due to changes to emission control laws and subsequent acceptance by Australia, all engines imported in Australia must be Euro 4 compliant. There are basically two types of diesel engines readily available for the Australian market. There are however, many variants of these basic types of engines.

Exhaust Gas Recirculation (EGR):

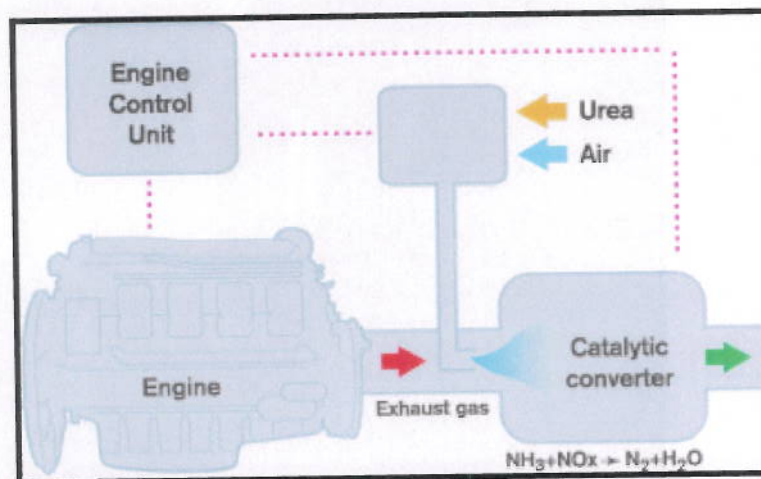
Exhaust gas recirculation is a Nitrous Oxide (NOx) emissions reduction technique used in most gasoline and diesel engines.

EGR works by recirculating a portion of an engine's exhaust gas back to the engine cylinders. Intermixing the incoming air with recirculated exhaust gas dilutes the mix with inert gas, lowering the adiabatic flame temperature and (in diesel engines) reducing the amount of excess oxygen. The exhaust gas also increases the specific heat capacity of the mix lowering the peak combustion temperature. Because NOx formation progresses much faster at high temperatures, EGR serves to limit the generation of NOx. NOx is primarily formed when a mix of nitrogen and oxygen is subjected to high temperatures.

Selective Catalytic Converter (SCR):

SCR is an after treatment method that requires a urea-based additive, such as AdBlue, to reduce emissions. An additional tank on the vehicle is fitted for the urea-based additive. The urea-based additive is injected in the exhaust to maintain a reaction in the catalytic converter, which is integrated in the silencer. This after treatment method is used to reduce Nitrous Oxide (NOx).

An SCR system is efficient at highway speed, high engine load and high gross weight. A small advantage in fuel consumption must be balanced against the cost and availability of the urea-based additive.



Advantages / Disadvantages:

A benefit of the EGR system is that drivers do not need to change current practices. They refuel their vehicles in the same manner. A disadvantage is that the engine runs considerable hotter and requires greater cooling. This is generally achieved by larger radiators, which in turn requires larger and higher cabins. For some vehicles this may not be an issue, however for a vehicle where the centre of gravity is a concern such as aerial appliances for fire services, this is not acceptable.

For vehicles with SCR engines, drivers will be required to use an additive in proportion to the diesel being used. Availability, costs and manual handling issues will need to be considered in the purchase of these engines in the immediate future.

7.5 Transmissions

Automatic transmissions are increasingly being used in heavy vehicles for both urban and rural firefighting operations.

The majority of vehicles observed throughout the tour utilised Allison Automatics, both within Europe and North America. There are several new transmissions being introduced and all services were investigating their application. An option being considered is the Automotive Manual Transmission (AMT). There are currently several available within Australia. I did however have the opportunity to drive several Scania trucks at their test facility in Sweden. I was impressed by how the Opticruise transmission performed on a "B" double pulling over 60 tonnes.

Scania Opticruise – Key Points:

- ❖ In a modern vehicle, functions relating to the engine, gearbox, retarder, service brakes and suspension are controlled by electronics. Opticruise provides an integrated electronic link between many of these functions, optimising the driver's control over them. Opticruise is essentially a very simple system. In fact, all the electronic functions with which it interacts would be at work on the vehicle whether or not Opticruise is fitted to the truck.
- ❖ In automatic mode, gear selection is completed automatically. In manual mode, the driver decides and makes the change.
- ❖ The driver makes all the decisions and can interrupt the automatic process at any moment. Opticruise actually increases the driver's ability to control the vehicle and, if needed, take rapid and safe emergency action.
- ❖ The driver depresses the clutch pedal, selects drive, releases the clutch and with light pressure on the accelerator the vehicle moves off smoothly. There is no need to use the clutch again until the vehicle stops.
- ❖ Opticruise matches engine speed and gearbox speed perfectly before moving up or down a step or two. The change is smooth, clean and fast, helping to improve fuel consumption and protecting the power-train.

- ❖ Opticruise interacts with cruise control and the Scania Retarder, if fitted. This means automatic gear selection at the optimum time when climbing hills. A safe downhill speed in the appropriate gear can also be selected.

7.6 Tyres

One of the constant themes throughout the tour in both Europe and USA was the use of Michelin tyres. In particular, the XZE and XZY tyres were standard specification for on road use.

It was pleasing to see these tyres as it supports the decisions of both CFA and MFESB who both use these tyres for on and off road use.

Los Angeles County Fire Department spent several years investigating suitable tyres for their vehicles. They were pleased to see that we used the same tyres as their investigation recommended.

7.7 Safety Systems

There is no doubt that the greatest improvement in heavy vehicles is in the area of safety systems. We are now seeing systems normally accepted as standard features in general motor vehicles. These systems are generally classified as being active or passive.

Passive safety systems generally encompass the following:

- Passenger safety cell
- Deformation zones
- Seat belts
- Load space barrier-nets
- Air-bags,
- Laminated glass,
- Correctly positioned fuel tanks,
- Fuel pump kill switches etc.

Active Safety Systems are systems, such as –

- Intelligent Speed Adaptation (ISA)
- Anti lock Braking System (ABS)
- Traction Control (TC)
- Electronic Stability Control (ESC)
- Brake Assist (BA)
- Front Protection Under-run (FUPD)
- Lane Departure Warning System (LDW)
- Proximity Control (PC)

The following summarises active safety systems that are currently available. I have deliberately expanded on the following information as I believe that there is not enough known about some of these systems, especially in relation to heavy vehicles.

Intelligent Speed Adaptation (ISA)

ISA is any system that constantly monitors the local speed limit and the vehicle speed and implements an action when the vehicle is found to be exceeding the speed limit. This can be done through an advisory system, where the driver is warned, or through an active system where the driving systems of the vehicle are controlled automatically to reduce the vehicle's speed. Intelligent speed adaptation uses information about the area through which the vehicle travels to make decisions about what the correct speed should be.

Intelligent systems know when the vehicle has entered a new speed zone, know when variable speed zones are in force (e.g. school zones) and can be configured to work with temporary speed zones (such as at accident scenes or near road works). The purpose of ISA is to assist the driver in keeping to the lawful speed limit at all times, particularly as they pass through different speed 'zones'. ISA is intended to help drivers stick to the speed limit when they are in unfamiliar areas or when they pass through areas where variable speed limits are used.

There are two types of speed adaptation systems, passive and active, the basic difference being that passive systems simply warn the driver of excess speed and active systems automatically correct the vehicle's speed. Passive systems are generally driver advisory systems: they alert the driver to the fact that they are speeding and allow the driver to make a choice on what action should be taken.

ABS

An anti-lock braking system (ABS) (translated from German, *Anti-Blockier System*) is a safety system on motor vehicles which prevents the wheels from locking while braking.

A rotating road wheel allows the driver to maintain steering control under heavy braking, by preventing a locked wheel or skid, and allowing the wheel to continue to forward roll and create lateral control, as directed by driver steering inputs. Disadvantages of the system include increased braking distances under some limited circumstances (ice, snow, gravel, "soft" surfaces), and the creation of a "false sense of security" among drivers who do not understand the operation, and limitations of ABS.

Since it came into widespread use in production cars (with "version 2" in 1978), ABS has made considerable progress. Recent versions not only handle the ABS function itself (i.e. preventing wheel locking under braking), but also electronic control of the front-to-rear bias known as electronic brake-force distribution (EBD), traction control system (TCS or ASR), an "emergency" brake assist (BA, EBA or HBA), and electronic stability control (ESP, ESC or DSC), amongst others.

A 2003 Australian study by Monash University Accident Research Centre found that ABS:

- Reduced the risk of multiple vehicle crashes by 18 percent,
- Reduced the risk of run-off-road crashes by 35 percent.

On high-traction surfaces such as bitumen, or concrete, many (though not all) ABS-equipped cars are able to attain braking distances better (i.e. shorter) than those that would be easily possible without the benefit of ABS. Even an alert, skilled driver without ABS would find it difficult, even through the use of techniques like threshold braking, to match or improve on the performance of a typical driver with an ABS-equipped vehicle, in real world conditions. ABS reduces chances of crashing, and/or the severity of impact.

The recommended technique for non-expert drivers in an ABS-equipped car, in a typical full-braking emergency, is to press the brake pedal as firmly as possible and, where appropriate, to steer around obstructions. In such situations, ABS will significantly reduce the chances of a skid and subsequent loss of control.

In gravel, sand and deep snow, ABS tends to increase braking distances. On these surfaces, locked wheels dig in and stop the vehicle more quickly. ABS prevents this from occurring. Some ABS calibrations reduce this problem by slowing the cycling time, thus letting the wheels repeatedly briefly lock and unlock. The primary benefit of ABS on such surfaces is to increase the ability of the driver to maintain control of the car rather than go into a skid — though loss of control remains more likely on soft surfaces like gravel or slippery surfaces like snow or ice. On a very slippery surface such as sheet ice or gravel, it is possible to lock multiple wheels at once, and this can defeat ABS (which relies on comparing all four wheels and detecting individual wheels skidding). Availability of ABS relieves most drivers from learning threshold braking.

Traction Control System (TCS)

A traction control system, also known as Anti-Slip Regulation (ASR), on current production vehicles, are typically (but not necessarily) electro-hydraulic systems, designed to prevent loss of traction of the driven road wheels, and therefore the control of the vehicle, when excessive throttle is applied by the driver, and the condition of the road surface (due to varying factors) is unable to cope with the torque applied. Although similar to electronic stability control (ESP) systems, traction control systems do not have the same goal.

The intervention can consist of any, or all, of the following:

- Retard or suppress the spark to one or more cylinders
- Reduce fuel supply to one or more cylinders
- Brake one or more wheels
- Close the throttle, if the vehicle is fitted with drive by wire throttle.
- In turbo-charged vehicles, the boost control solenoid can be actuated to reduce boost and therefore engine power.

Typically, the traction control system shares the electro-hydraulic brake actuator (but does not use the conventional master cylinder and servo), and the wheel speed sensors with the anti-lock braking system.

In road cars: Traction control has traditionally been a safety feature in high-performance cars, which would otherwise need very sensitive throttle input to keep them from spinning the driven wheels when accelerating, especially in wet, icy or snowy conditions. In recent years, traction control systems have become widely available in non-performance cars, minivans, and light trucks.

In off road vehicles: Traction control is used instead or in addition to the mechanical limited slip or locking differential. It is often implemented with an electronic limited slip differential, as well as other computerised controls of the engine and transmission. The spinning wheel is slowed down with short applications of brakes, diverting more torque to the non-spinning wheel. This form of traction control has an advantage over a locking differential, as steering and control of a vehicle is easier, so the system can be continuously enabled. It also creates less stress on the drive-train, which is particularly important to the vehicles with an independent suspension that is generally weaker compared to solid axles. On the other hand, only half of the available torque will be applied to a wheel with traction, compared to a locked differential, and handling is less predictable.¹

Traction control is not just used for moving a vehicle from stationary without slippage. During hard maneuvers in a front-wheel drive car, there is a point where the wheels cannot both steer and drive the car at the same time without losing traction. With traction control, it's less likely for this loss of control to occur. There is a limit though, when the tyres lose grip. If the car does not corner as sharply as indicated by the front wheels, under-steering occurs. In some front-wheel drive cars, traction control can induce lift-off over-steering due to its throttle retarding capabilities. This can keep some cars stable in long maneuvers. In rear wheel drive cars, traction control can prevent over-steering.

All car manufacturers strongly point out in vehicle manuals that the traction control system is not to be taken for granted, and that its presence should not encourage dangerous driving or situations beyond the driver's control.

Electronic Stability Program (ESP) or Vehicle Stability Control (VSC)

Stability control is a computerised technology that improves the safety of a vehicle's handling by detecting and preventing skids. When ESC detects loss of steering control, ESC automatically applies individual brakes to help "steer" the vehicle where the driver wants to go. Braking is automatically applied to individual wheels, such as the outer front wheel to counter over-steer, or the inner rear wheel to counter under-steer. Some ESC systems also reduce engine power until control is regained.

During normal driving, ESC works in the background, continuously monitoring steering and vehicle direction. ESC compares the driver's intended direction (by measuring steering angle) to the vehicle's actual direction (by measuring lateral acceleration, vehicle rotation (yaw), and individual road wheel speeds).

ESC only intervenes when it detects loss of steering control, i.e. when the vehicle is not going where the driver is steering. This may happen, for example, when skidding during emergency evasive swerves, under-steer or over-steer during poorly judged turns on slippery roads, or hydroplaning. ESC measures the direction of the skid, and then applies the brakes to individual wheels asymmetrically in order to create torque about the vehicle's vertical axis, opposing the skid and bringing the vehicle back in line with the driver's commanded direction. Additionally, the system may reduce engine power or operate the transmission to slow the vehicle down.

ESC can work on any surface, from dry pavement to frozen lakes. It reacts to and corrects skidding much faster and more effectively than the typical human driver, often before the driver is even aware of any imminent loss of control. In fact, this led to some concern that ESC could allow drivers to become overconfident in their vehicle's handling and/or their own driving skills. For this reason, ESC systems typically inform the driver when they intervene, so that the driver knows that the vehicle's handling limits have been approached. Most activate a dashboard indicator light and/or alert tone; some intentionally allow the vehicle's corrected course to deviate very slightly from the driver-commanded direction, even if it is possible to more precisely match it.

Brake Assist

Brake Assist is a generic term for an automobile braking technology that increases braking pressure in an emergency situation.

Research conducted in 1992 at the Mercedes-Benz driving simulator in Berlin revealed that more than 90% percent of drivers fail to brake with enough force in emergency situations. Brake Assist detects circumstances in which emergency braking is required by measuring the speed with which the brake pedal is depressed. Some systems additionally take into account the rapidity of which the gas pedal is released, pre-tensioning the brakes when a "panic release" of the gas is noted.

When panic braking is detected, the Brake Assist system automatically develops maximum brake boost in order to mitigate a driver's tendency to brake without enough force.

In doing so, Brake Assist has been shown to reduce stopping distance by a significant margin; up to 20% in some studies.

Front Protection Under-run (FUPD)

Front Protection Under-run systems are designed to ensure safety features of passenger cars (e.g. air bags and crumple zones) are deployed during a front-on collision and prevent underrunning.

FUPD is expected to reduce fatalities and the severity of injuries.

Lane Departure Warning System

The lane departure warning system warns drivers when there is a risk of the vehicle drifting off to the side of the road.

The system comprises a small camera behind the windscreen which tracks the road surface just in front of the vehicle. If it seems that the vehicle is straying from its lane unintentionally, a sharp “rumble strip” sound will be emitted from the radio speaker on the same side, causing the driver to steer intuitively in the opposite direction.

Proximity Control (PC)

Proximity control automatically ensures that the road speed and the distance between the vehicle and the vehicle in front are adapted to the changing traffic conditions.

A radar sensor system monitors the traffic in front of the vehicle, recording the distance between the vehicles and evaluating the changes in these distances.

The vehicle ECU decelerates the vehicle by means of the service and auxiliary brakes and accelerates the vehicles using the cruise control function – without the driver having to do anything but steer.

Summary

The majority of the safety features described above is currently standard or an available feature in most new cars available in Australia. Some, however limited, are now available in heavy vehicles. I cannot place enough emphasis on ESO's seriously considering having these safety systems included as mandatory specifications of all future purchases as they become available.

7.8 Dealing with manufacturers

A strong relationship with any local industry makes good business sense. Many issues can be easily dealt with when we have strong personal relationships directly between dealers and clients.

A major advantage of meeting with key personnel from the various manufacturers was getting the latest up to date accurate information. On several occasions I realised that the local representatives do not always have the latest accurate information due to several reasons.

7.9 Custom Built Vehicles

Many manufacturers are now building custom built vehicles to cater for specialist markets. Mercedes and Scania for example produce a “fire” version crew cab which has been developed after consultation and feedback from the end users. There are many advantages in ESO’s specifying these custom built cab chassis.

7.10 Vehicle Bodies

General

Vehicle bodies, especially on firefighting vehicles, tend to be constructed of fibreglass. This enables the weight to be reduced without losing strength. During my tour, I did not encounter any vehicles using fibreglass. Aluminium was the most popular; however the London Fire Brigade are currently using plastic moulded bodies. They stated that the main advantages are that they are strong, durable and easily repaired.



**Aluminium
construction is
use by
Rosenbauer
in Europe**

Plastic body used by Asset Co for London Fire Brigade



In Europe, the trend is not to paint the vehicle bodies. Modern practice is to prime the body and then to use reflective coloured tape or panels to provide the final finish. This concept has several advantages.

- The cost is dramatically reduced
- Repairs are easier and quicker
- If sections fade, it is easy to replace
- Changes in design/s are easier to update

Vehicle – Striping

All ESO's around the world appear to be experimenting with different options for improving vehicle visibility and therefore safety. Below are some of the varying designs that I observed.



London Fire Brigade



Metz Ladder

Safer Vehicles – Safer Drivers



Fairfax County Fire Department



Rosenbauer



Berlin Fire Brigade Ambulance



Stockholm Fire Brigade Command Vehicle



Frankfurt Fire Brigade Pumper



London Fire Brigade



London Police



London Police

Currently within CFA, we are using striping in limited amounts. However, we outline the vehicle with 25 or 50 mm reflective tape which is dramatically increasing the visibility of the vehicle without huge costs. Several organisations that I visited expressed interest in what we are doing and requested pictures of our vehicles.

7.11 Standardised fleets

As ESO's we all strive to standardise our fleet. Due to many varying factors, this generally does not occur. Several organisations that I visited have been able to do this. These were fire services that have one type of pumper, one aerial and one rescue vehicle within the total fleet. Irrespective of where you are detailed to work, the vehicles are identical, including stowage.

7.12 Warning devices

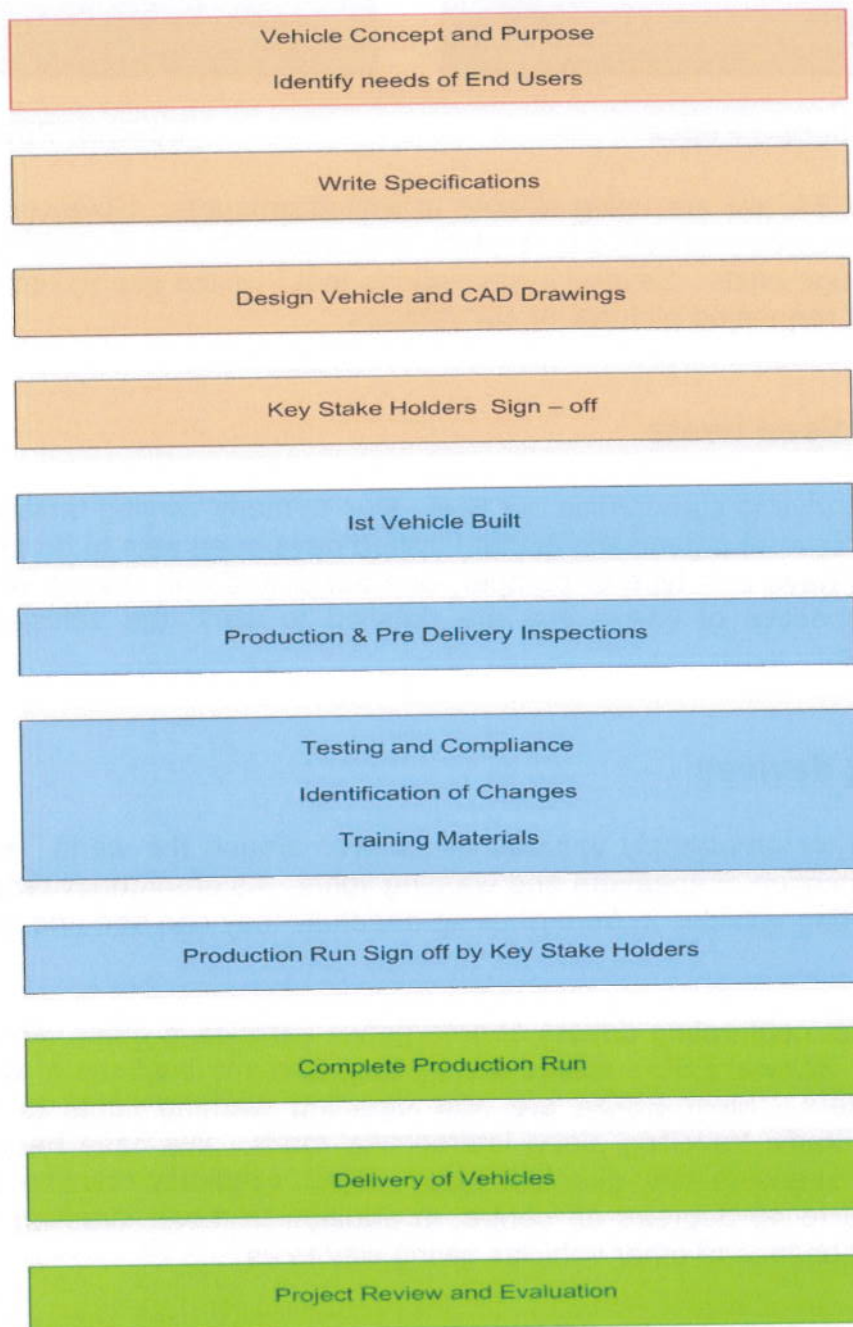
Warning devices for emergency vehicles are similar around the world. What does vary however; is the location of speakers and warning lights. As emergency responders we are conscious of alerting vehicles in front of us so hopefully they can see and hear us and give a clear passage.

The other problem confronting drivers of emergency vehicles is other vehicles giving way at intersections. Several ESO's visited are trialling different locations of warning devices, especially speakers. Most ESO's are now directing warning lights to the side at 45 degrees to alert traffic travelling along intersecting roads. We have been slow to direct sound from the sirens in this direction also. Siren speakers pointing at an angle of approximately 30 to 45 degrees off centre, in addition to those directing straight ahead, provide a greater chance of other vehicles giving way to us.

7.13 Production process

The majority of fire services visited have all experienced issues in relation to getting the production process right. As ESO's, we tend to build a production run and then realise that we need or would like to make changes. These changes, if possible often incur penalties from the manufacturers and may delay the introduction of vehicles into the respective fleets.

The following process was generally used by most ESO's.



8. Vehicles - Specific

8.1 Compact Pumpers

A challenge for ESO's is to provide suitable emergency response vehicles for smaller communities. It is often very difficult to justify the costs of larger vehicles where activity is low.

As part of my visit to Rosenbauer in Austria, I travelled to their specialist vehicle plant to observe smaller compact pumpers. These vehicles are designed and manufactured around smaller compact commercially available cab chassis. The vehicles that were being built at the time were based upon Mercedes and Renault platforms.



The body incorporates a crew seating area immediately behind the driver and passenger. Large roller locker doors provide access to the pump and general firefighting equipment.





8.2 Wildfire Vehicles

Throughout the tour, the only opportunity to inspect wildfire vehicles was in the USA. In particular I was keen to see what Calfire was using as their operations are very similar in many ways to Fire Services in South Eastern Australia. In contrast to their urban vehicles which are primarily all custom built, wildfire vehicles are generally built upon commercially available cab chassis.

Unlike most of our vehicles, all firefighting operations are conducted off the vehicle. There is no room to allow firefighters to work on the vehicle whilst it is mobile.

Safer Vehicles – Safer Drivers



This vehicle is a standard Class 3 Tanker being introduced into Calfire.

All new vehicles will now be based upon this design and the only difference is that they will be either two or four wheel drive.

This obviously has many advantages; these being standardisation of operation, stowage and training / assessment purposes.



This Class 3 vehicle is in use by Big Bear Lake Fire Department

8.3 Aerial appliances

During the period of my tour, CFA was finalising specifications for new aerial appliances. I was keen to see what other manufacturers had to offer and whether they were interested in the Australian market. Within Australian Fire Services, the most popular aerial appliance is a ladder platform manufactured by Bronto Skylift in Finland. The later vehicles are all based upon the Scania 8 x 4 single cab chassis.

Turntable Ladders are the most popular form of aerial appliances in both Europe and North America. Even though Platforms are being more widely used, they are greatly outnumbered. In Europe, this is mainly due to building regulations which require all building over 22 metres to have fire rated stairwells installed. Buildings under this distance are not mandatory required to have external fire escapes and they rely on the fire services to provide alternate escapes.

There are four main manufacturers of ladder platforms in Europe. These being; Bronto Skylift, Magirus, Metz and Vema. I had the opportunity to inspect and use three of the four with Vema not being seen on my tour.

Bronto Skylift:



Key Features:

- ❖ 22 - 56 metres working height versions available
- ❖ New RLX models have larger cage and load capacity (500kg)
- ❖ 3800 lpm at monitor

Magirus:



Key Features:

- ❖ 32 to 54 metres working height versions available
- ❖ 400 kg cage load capacity
- ❖ 2400 lpm at monitor

Metz:



Key Features:

- ❖ 27 to 54 metres working height versions available
- ❖ Large cage
- ❖ 2300 lpm at monitor (32 metre version)

Safer Vehicles – Safer Drivers

In addition to the Ladder Platforms, I was made aware of two other aerial appliances that may be suitable for Australia. These being a Bronto Allrounder and CTL.

The CTL consists of a boom with ladder and is similar in operation to a Telesquirt.

The Allrounder is a compact platform that is suited for crew cab vehicles being used in urban applications as a primary response vehicle. It offers the flexibility of a pumper and small aerial capabilities from 17 metres to 29 metres.



Bronto Allrounder



Bronto CTL

8.4 Chemical, Biological, Nuclear, Radiation (CBNR) Vehicles

Within United Kingdom and the European Union, counter terrorism funding has provided the opportunity to standardise vehicles used to combat incidents involving CBNR. The Mercedes 316 Sprinter is used for these vehicles. As these vehicles and personal could be used anywhere with Europe, each vehicle, irrespective of location is similar in design and stowage.

The vehicle provides seating for a crew of four, two of which are located behind the driver and front passenger. These two operators can work en-route using computers.



Safer Vehicles – Safer Drivers

A feature of these vehicles is the Sortino stowage system. Equipment is stowed in dust and water proof draws each especially fitted out to protect the technical equipment.



Rear view of stowage system.



View of stowage system from inside vehicle.

8.5 Incident Command/Control Vehicles

Throughout Europe and North America, the fire services used command and control vehicles for level 2 and 3 type incidents. These incidents warranted the attendance of senior officers with incident control system (ICS) qualifications. These officers are on shift and to assist them in performing these duties, dedicated vehicles were used.



Stockholm Fire Department



Berlin Fire Brigade

8.6 Special Ambulance – Frankfurt Fire Brigade:

ESO personal around the world are unfortunately required to treat and transport extremely obese people. To overcome some of the logistical problems associated with the transport of these people, Frankfurt Fire Brigade have designed this special ambulance. Its greatest advantage is that the body is height adjustable to suit the various hospital loading ramps and to assist with loading the stretcher. The stretcher is capable of holding extremely large persons. There is no equipment stored upon the unit, with necessary medical equipment being used from normal response ambulances. This makes the unit easier to clean.



Another use of this vehicle is the transportation of persons with infectious diseases. The body is air tight and it can be quickly modified to seat nine patients.

Safer Vehicles – Safer Drivers



8.7 Rail Rescue Vehicle – Frankfurt Fire Brigade

This vehicle has been designed to access the underground rail system within Frankfurt. It has the ability to travel along the rail tracks, providing accessibility directly to the scene of any incident. The cabin has rear access doors that allow the firefighters to leave the cabin without opening the drivers' and passenger door which is impossible due to the restrictive size of the rail tunnel system. The narrow storage area provides the necessary rescue equipment and also allows for stretchers to be placed on each side of the back providing transportation for injured or deceased persons.



8.8 Small Ladder – Stockholm Fire Brigade



This mobile turntable ladder is used within the “old town” of Stockholm which has narrow winding streets. The ladder is driven as close as possible then located as required. It operates on the “line of sight” principle with a projection of 20 metres.

8.9 Mobile Remote Operated Positive Pressure Ventilation (PPV) Fan – Frankfurt Fire Brigade



This fan is similar to many that I observed throughout Europe. They are primarily used to assist air and smoke movement within underground rail and road systems. This unit is remotely operated utilising a camera and allows the operator to stay in a safe location whilst positioning the unit as required.

8.10 Rural Tanker – Montgomery County Fire Department



Montgomery County has a diverse mix of urban and rural development in its area. Even though it is close to Washington DC, it has expanses of rural areas which are filled with large residential houses. These properties are normally located on 10 and 20 acre properties with long drives and no reticulated water available. In the event of a fire involving one of these large houses, water relays are used to flow water from the nearest major road to the fire scene.

This concept has been discussed within CFA and would provide a "mother ship" concept to fill vehicles within strike teams, etc.

8.11 Platforms on Demand (PODS)

The concept of PODS has been discussed for many years. Debate centres around their suitability, flexibility and how many tow vehicles you need. Within Australia, there appears to be a trend towards this concept. I found that PODS were more popular in Europe than in North America. I believe that funding is a major factor in this decision. The European services, similar to Australia, do not have the available funds compared generally to North America.

Safer Vehicles – Safer Drivers

During my tour, I found PODS being used for the following purposes.

- Hazmat
- Mass decontamination packs
- Generators & lighting
- Foam
- Breathing apparatus and gas suits
- Confined space
- Trench rescue
- Specialist pumps
- Medical
- Sandbags
- Hose
- Command & control
- Firefighter welfare
- Canteen
- USAR



Communication – Frankfurt Fire Brigade

Safer Vehicles – Safer Drivers



Foam – Frankfurt Fire Brigade



Firefighter welfare – Frankfurt Fire Brigade



Prime mover – Frankfurt Fire Brigade

Safer Vehicles – Safer Drivers



USAR – London Fire Brigade



9. Pumping

9.1 General

The location of pumps on firefighting vehicles has been subject to debate since their inception. Throughout Europe, rear mounted pumps is the standard, however some departments have limited number of mid-ship mounted pumps. In Northern America it is the opposite, however there is a growing trend towards rear mounted pumps. It is estimated that over 90 % of the world's fire services use rear mounted pumps.

There is always debate as to whether it is safer for a fire-fighter to be operating a pump at the rear or on the side. It is interesting to note that North American Fire Services are now seriously considering rear operated pumps due to safety reasons.

Additional benefits include improved operator visibility, additional compartment space, lighter pump weight and easier access.

I was interested to explore two concepts that are not normally seen here in Australia.

Mid-ship mounted - rear operated

A concept that I encountered in Stockholm is a mid-ship mounted pump with rear controls. Stockholm Fire Brigade and Scania Trucks are developing a Pumper where the centrifugal pump is mounted directly to the Power Take Off (PTO). Scania modify the crew cabin in its factory to allow for the pump. The pump control panel is rear mounted and operated. The inlet and delivery manifolds are also rear mounted and plumbed directly to the pump. This concept provides a quieter pump as there is no need for a divider or step-up box which is often noisy.

A disadvantage to using mid-ship pumps can be that the weight over the front axle is increased in comparison to rear mounted pumps. Due to the limited load limits with have in Australia, especially over the front axle, the water capacity is often reduced to ensure we met the specified ratings.

The pump can be serviced by raising the cabin and working on it in the same manner as the driveline, etc.

Mid-ship mounted - side operated

A new concept in the USA at the moment is a mid-ship mounted pump, except the control panel is mounted at the rear with rear side controls. This is to allow the pump operator to be away from the rear of the vehicle. This could possibly be a safer position as the operator can stand on a nature strip, footpath, etc. It is worth noting though, that anecdotal evidence suggests that very few firefighters have been injured or killed whilst operating at the rear of a vehicle.

There is evidence that drivers who fail to see the pump operator or vehicle generally swerve at the last minute and collide with the side of the vehicle instead. For this reason, firefighters should always be careful of working on the side of any appliance which exposes them to moving traffic.

9.2 Compressed Air Foam System (CAFS):

In both Europe and North America, the use of CAFS for both urban and rural firefighting operations is increasing. In Europe, the primary use of CAFS is in structural applications to assist with knockdown and the substantial reduction in water use.

Several large USA fire departments such as Phoenix, LA County and San Diego all have CAFS on their pumpers. LA County Fire Department have been fitting CAFS to all new pumpers for over 10 years to assist with fire protection and suppression activities in their urban/rural interface areas. Not only is CAFS used for structural firefighting purposes, it is also used to protect structures by spraying foam on buildings prior to the arrival of a wildfire. They set up several vehicles along a street and proceed from house to house. A single house can be protected in approximately five minutes. This system is now being preferred over other systems used such as gels, etc as foam is easier to clean off buildings after the fire passes.

Rosenbauer (America) estimates that 80% of all new pumper orders specify CAFS.

9.3 Fire Hose Reels:

Hose reels and their use was a topical subject in both Europe and North America. In the USA, their use is currently being debated as a result of nine Charleston Fire Department Firefighters dying at a sofa store fire in 2007.

In Australia, we have been generally using live hose reels for urban and structural operations for at least 30 years. Within CFA, initial use was for the application of high pressure fog into closed environments such as bedrooms, kitchens, etc. Over the last 30 years, their use has become more widespread due to their flexibility, perceived quickness of water application and less maintenance.

In Europe, I observed high pressure hose reels being fitted to new appliances, however I was advised that all fire brigades that request them, restrict their use. In the USA, I did not see any hose reels on pumpers. Departments advised that if they did have hose reels on older appliances, their use were restricted to external firefighting only. It is also important to mention that most fire departments also ban their use on vehicle fires.

The following comments have been quoted from Firehouse magazine and help explain the concerns by some people.

“Some fire departments don't even carry booster lines on their trucks, to avoid the possibility that they will be pulled in the wrong situation, placing firefighters in jeopardy. Departments that still carry them generally use booster lines for small tasks such as extinguishing grass fires, washing off a roadway after a car accident or smothering a trash fire, experts said.

Booster lines are pulled from reels and draw water from large tanks contained within the fire truck. Their nozzles are typically an inch (25mm) in diameter and can spray 30 to 60 gallons (115 – 230 lpm) of water per minute. Larger hoses, called attack lines, can spray 150 gallons (570 lpm) per minute or more, which many fire safety experts say is the minimum needed for attacking a structure fire.

Using booster lines can be risky because they leave little room for error when matched against today's fires, which burn hotter because of an abundance of man-made combustible materials.

If firefighters are unable to quell a small fire using a booster line, the fire hose can quickly become powerless against a growing fire, allowing it to spread. Firefighters also need enough water to protect themselves from flames.

For just those reasons, the Mount Pleasant Fire Department stopped widespread use of booster lines 15 years ago, but keeps one around for the occasional grass fire. Isle of Palms firefighters stopped using booster lines in the 1980s, and the Greenville Fire Department followed suit a decade later.

Savannah firefighters keep some booster lines on reserve trucks, but they are mainly used for washing off equipment or hosing off fluids.

Myrtle Beach Fire Chief Alvin Payne, a 30-year veteran of the fire service, isn't ready to abandon these small hoses. He said booster lines have their place, but he won't allow his firefighters to use them on a burning building. “We don't use them for structure fires. Whenever you are attacking a structure fire, you want to protect your personnel, and a booster line doesn't put out enough flow to protect personnel.”

Fire experts have raised similar safety concerns. A 2001 journal article published by the National Fire Protection Association (NFPA) concluded that booster lines “offer little chance of extinguishment and often place firefighters in danger.”

The paper's authors said arguments that booster lines might help preserve property because of their low water flow don't hold up to scrutiny. “A higher rate of flow, properly applied, results in quick extinguishment and less water damage. Conversely, water applied through small, inadequate attack lines results in more water, fire and smoke damage and often places firefighters and occupants in danger.”

One of the paper's authors, Russ Sanders, is a former chief of the Louisville Fire Department in Kentucky and now works for the National Fire Protection Association, the organisation that writes federal firefighting safety guidelines.

He is the co-author of "Structural Fire Fighting," a textbook published in 2000 that is widely used and cited in the fire service.

Sanders said he has no direct knowledge of the Charleston fire and spoke only in general terms about the use of booster lines in firefighting. "We don't feel it is ever appropriate to attack an interior structure fire with a booster line. They are too dangerous."

Still, Columbia Fire Chief Bradley Anderson said booster lines remain popular among some of his firefighters because of their utility. The department had been moving away from buying trucks with booster reels but has since gone back to ordering them because firefighters prefer them for dousing nuisance blazes.

"We use them for overhaul at the end of fires to put out hot spots," Anderson said. "We would not use them to attack a fire because of their low flow."

Comment

CFA and other Australian Fire Services are currently introducing new Structural Protective Clothing (PPC) which provides greater protection from radiated heat. I am greatly concerned that the combination of greater protection and reduced flow rates from hose reels may lead to injuries and/or death amongst our ranks.

Driving

10.1 General

We know that driving vehicles is a very emotive subject, especially amongst emergency services personnel. The common factor within all ESO's responding to community calls for assistance is that we generally need to drive vehicles. Within Australia, ESO's have accepted what is commonly referred to as the Hendon System of Vehicle Control. Our licence testing agencies also use the principles of this system for licence testing. Within Europe and United Kingdom, the Hendon System is the standard, where as in North America, the Smith System is used.

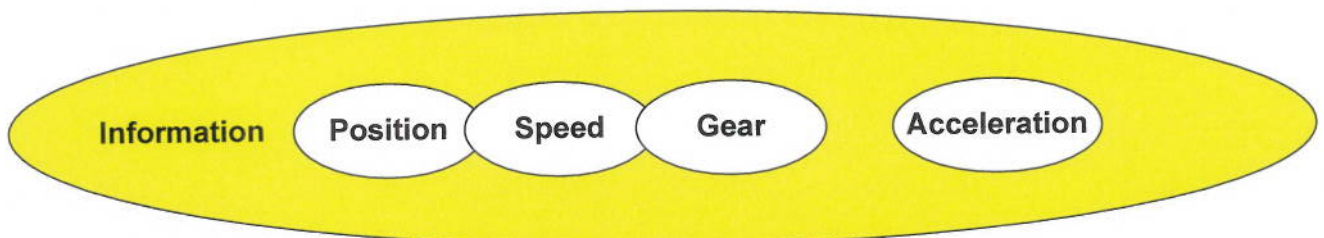
It is interesting to note that "Roadcraft – the Police Driver's Handbook" does not refer to the term "Hendon" at all. It only refers to the "the system".

10.2 Vehicle Control

The "Hendon" System:

The system as described within Roadcraft - The police driver's handbook, outlines a system of car and motorcycle control split into five phases represented by the acronym IPSGA:

1. **Information** received from the outside world by observation, and given by use of signals such as direction indicators, headlamp flashes, and horn;
2. **Position** on the road optimised for safety, visibility and correct routing, followed by best progress;
3. **Speed** appropriate to the hazard being approached, attained via explicit braking or throttle control (engine braking), always being able to stop in the distance you can see to be clear on your side of the road;
4. **Gear** appropriate for maximum vehicle control through the hazard, selected in one shift; and
5. **Acceleration** for clearing the hazard safely.



The Information phase is, arguably, the most important phase, and surrounds (and drives) the other four phases. It may, and often should, be re-applied at any phase in the System.

The System is used whenever a hazard requires a maneuver. A hazard is something which requires a change in speed, direction or both.

The benefit of applying a systematic approach to driving is to reduce the simultaneous demands on the vehicle, the driver mentally and the driver physically. That is, the System seeks to separate out the phases of a maneuver into a logical sequence so that the vehicle and the driver avoid being overwhelmed by having to do too much at the same time. For example, braking and steering at the same time place greater demands on the vehicle's available grip and in the worst case can lead to a skid.

Driver training conducted at Hendon is based upon the four “S” principle.

SAFETY	- Cannot be compromised at any time
SYSTEM	- Complied with at all times
SMOOTHNESS	- Driver and vehicle
SPEED	- A by-product of the above three factors

The following points were taken from my experience of being driven across London under emergency conditions-

- Driver tried to always acknowledge drivers or pedestrians who gave way to them
- Waved to children where possible to build up repour
- Vehicle always positioned to maximise visibility to oncoming traffic
- Driver used hands to direct/control traffic/pedestrians
- Never pressured drivers and allowed them time to sort themselves out
- Always backed off speed prior to intersection to let sound enter before vehicle

The “Smith” System:

As a driving instructor in 1946, Harold L. Smith was frustrated. Smith believed that drivers could be taught how to avoid collisions, but he needed time to develop his ideas. He began studying how the eyes work and related that to how drivers respond to what they see on the road. In 1948, he began teaching the eye-mind coordination that has led to the time-tested 5 KEYS TO SPACE CUSHION DRIVING known as the Smith System. In 1952, Smith went on to establish the Smith System Driver Improvement Institute, the nation's first professional driver training company. Since then, hundreds of thousands of drivers throughout the world have benefited from the program he developed.

Today, with more than four times the number of registered vehicles on the road than when he first developed the program, Harold Smith's vision is more relevant than ever. Despite billions spent on vehicle safety improvements, highway fatalities in 2002 reached the highest level since 1990. The National Transportation Safety Board investigations of major truck crashes repeatedly demonstrate the need for improved driver performance. As Smith believed, most collisions are preventable if the right precautions are learned, practiced and used consistently.

Over its 50 year history, Smith System instructors have studied and mastered techniques that are essential to understanding driver perceptual behaviour patterns. These techniques help identify the strength and weaknesses of drivers and give them practical solutions to overcome specific driving deficiencies. With a focus on collision prevention, Smith System concepts help drivers to see, think, and act their way through a multitude of driving environments, challenges and changes that exist no matter where they travel or what types of vehicles they operate. Total awareness, perceptive anticipation, accurate forecasting, early detection, and deliberate reaction are the primary features of these proven techniques.

The five key points to the Smith System are:

- ❖ Aim high in steering
- ❖ Get the big picture
- ❖ Keep your eyes moving
- ❖ Leave yourself an out
- ❖ Make sure they see you

10.3 Driver Education Programs

Europe:

Throughout Europe there was no specified standard for training and assessing drivers of firefighting vehicles that I became aware of. The following is a summary of each respective organisation in relation to driver education.

Berlin Fire Brigade:

- One appointed driving instructor
- All training outsourced to private company
- Three dedicated vehicles for driver education
- On road driving course - 4 days
- Using simulator through private company
- Legislation requires all fire and police personnel to complete minimum of one day driver education

Frankfurt Fire Brigade:

- Three dedicated driving instructors
- Two dedicated vehicles for driver education
- On road driving course – 5 days
- Endorsement mandatory for all vehicles

Stockholm Fire Department:

- On road driving course – 5 days

London Fire Brigade:

- On road driving course – 5 days
- Legislation requires all drivers using emergency vehicle exemptions to have passed National Accredited Course
- Legislation allows for driver education and assessments under emergency conditions. Vehicles must be fitted with Incident Data Recorders (IDR's) and DriveCam systems

London Metropolitan Police:

The exception that I encountered in Europe was the London Metropolitan Police who are seen as world leaders in driver education.

- Standard Car Course 10 days
- Instructor Course 20 days
- Re-assessment 3 – 5 years
- Eye sight tests 3 years
- Drivers are banned from driving if taking medication that states that driving may be affected
- All vehicles are fitted with Incident Data Recorders (IDR's) and currently running trails with DriveCam.

North America

In North America, all departments visited conducted driver education and assessments in accordance with NPFA 1002 - Standard on Fire Apparatus Driver/Operator Professional Qualifications. NPFA 1002 is not mandatory, however is used as a reference and standard for all investigative purposes and is generally adopted by most fire departments.

Chapter 1.1 states that this standard shall identify the minimum job performance requirements for fire fighters who drive and operate fire apparatus, in both emergency and non emergency situations.

The standard describes the requirements for all apparatus likely to be driven and operated by firefighters including wildfire vehicles. Included within the standard are slow speed vehicle handling skills related tasks.

Safer Vehicles – Safer Drivers

For off road driving, the following applies-

8.1.2 Operate a wildfire fire apparatus, given a predetermined route off a public way that incorporates the manoeuvres and features specified in the following list that the driver / operator is expected to encounter during normal operations, so that that the vehicle is operated in compliance with all applicable departmental rules and regulations, the requirements of NFPA 1500, Section 6.2 and the design limitations of the vehicle:

- ✓ Loose or wet soil
- ✓ Steep grades (30% fore and aft)
- ✓ Limited sight distance
- ✓ Blind curve
- ✓ Vehicle clearance obstacles (height, width, undercarriage, angle of approach, angle of departure)
- ✓ Limited space for turnaround
- ✓ Side slopes (20% side to side)

NFPA Assessments

Within North America, practical driving assessments are conducted in accordance with the National Fire Protection Association (NFPA) 1002.

NFPA 1002 identifies the minimum job performance requirements for firefighters who drive and operate fire apparatus in both emergency and non emergency situations. This also includes requirements to drive vehicle in off road environments. The general requirements are-

Perform preventative maintenance

Drive vehicle under a variety of conditions

Skills test including:

- ✓ Reversing into a confined space
- ✓ Manoeuvring around obstacles, both forward and reverse
- ✓ Manoeuvring in areas with restricted horizontal and vertical clearances
- ✓ Completing a “U” turn using a spotter

It is my opinion that the assessment as described above is very skills oriented. Experience and statistics indicate that most collisions are a result of attitude, poor observation or not complying with legislative and organisation policies. A holistic approach would be to include all aspects of driver education in any program.

Safer Vehicles – Safer Drivers

The following is a summary of each respective organisation in relation to driver education.

Calfire

- Certification in accordance with NPFA 1002 for both on road and off road driving as applicable.

Los Angeles County Fire Department:

- 28 hours of training
- Certification in accordance with NPFA 1002

Montgomery County Fire Department:

- Certification in accordance with NPFA 1002

Fairfax County Fire Department:

- Certification in accordance with NPFA 1002

Fairfax City Fire Department:

- Minimum service of 1 year prior to training
- Local knowledge test of streets in primary response area
- Skills test using cones
- Time driving under non-emergency conditions
- 10 emergency response drives monitored for performance
- Certification in accordance with NPFA 1002

Washington DC Fire Department:

- 2 days of theory
- Program consists of self paced workbook and video's
- Driving simulator used as part of program
- Practical assessment on training college grounds.
- Certification in accordance with NPFA 1002

North Vancouver Fire Department:

- On road course – 8 days
- Drills conducted under lights and sirens
- Certification in accordance with NPFA 1002

Driver Training Complexes

Overall, most of the Emergency Services visited on this tour did not have dedicated driver training complexes. Two exceptions were London Metropolitan Police Service (MPS) at Hendon and Montgomery County Fire and Rescue Service in the USA. London Fire Brigade does have access to several old airstrips from time to time.

At MPS Hendon, they have two skid pans suitable for cars and use two access roads for specialist training for counter-hijacking skills. However the majority of their training is conducted on road.

Montgomery County has developed a training track and skills area used by both the Fire Service and the Police Force. The skills area is designed to meet the requirements of NFPA 1002.

10.5 Driving Simulators

All ESO's visited are using driving simulators, have investigated them or intend to ascertain their effectiveness in driver education. I had the opportunity to use one at Washington DC Fire Department. They have two units, one for the cab chassis and one for tiller operation.

A "tiller" is a Firefighter who sits in a rear cabin attached to the end of an aerial ladder and steers it. It is not a natural driving behaviour to steer a ladder. The initial movement for the tiller person is to steer in the opposite direction of the intended movement. The use of training simulators in this example provides a safer environment to practice skills as moving these vehicles requires great skills and reduces the risk to other road users.

There are several manufacturers of driving simulators that I was made ware of. These being FAAC, Doron and KMW. The following information has been taken from their respective websites.

FAAC

FAAC's Fire/EMS driver trainer simulators are fully interactive systems featuring state-of-the-art simulation technology that enables training in situation awareness, risk analysis, decision-making, emergency reaction and avoidance procedures, and conscientious equipment operation.

FAAC's Fire/EMS driver trainer simulators have been proven to reduce accidents and increase intersection analysis skills. The simulators can be used for both firefighting and EMS applications.

Features of unit

Driver cab

- A full power train (engine, transmission, axle ratio); accurate vehicle brakes; suspension system include shock absorbers, springs, and tire effects; a faithful replication of steering wheel feel and tendencies, and functional cab compartment controls.
- Vehicle models include: pumper trucks, tower trucks, tillers, aerial trucks, and tractor-drawn ladder trucks, EMS, and ambulance.
- Cabs are interchangeable. Switch between training programs to maximise the scope and efficiency of the simulator.
- Accurate reproduction cab dashboard components are installed to enhance the life-like training environment.
- FAAC's proprietary SmartNode™ software creates seat bounce and vibration from elements such as acceleration and braking, turning, and curb strikes.

Real-time Computer System

- FAAC's proprietary software system enables the student vehicle to respond to the environment and operator manoeuvres, such as speed, road friction, wind, and driver inputs.
- Controls out-the-window visual scenes and vehicle sounds as they relate to driving and student performance.
- Provides signals to the student vehicle dashboard instruments.
- Senses and responds to student inputs, such as hard braking and oversteering.
- Provides realistic interaction between other driving stations networked in the same training scenario.

Visual Display

- FAAC's system for creating the visual driving environment sets a high standard for virtual reality training products.
- A combination of front, side, and rear screens can provide an industry leading 315° field of view of crisp, clear, virtual training worlds.
- State-of-the-art flat screen monitors enable FAAC to install real side and rear-view mirrors that are vital to driver training.
- Real side and rear mirrors are available to provide critical training sessions on mirror usage techniques, such as leaning and blind spot identification.

Instructor Operator Station

- Provides a direct, real-time link between instructors and students within the training environment. Instructors can enter the training session as a vehicle or a pedestrian and create training elements for students.

Safer Vehicles – Safer Drivers

- Enables the instructor to manage one or several student driving sessions simultaneously and "fly" from one point in the training world to another to monitor specific events.
- Controls traffic, weather, equipment malfunctions, daylight, lesson storage, and assessment.
- Provides a location for instructor-student interaction tools, such as a desktop instructor driving console and pedestrian joystick control.

Sound

- Generates vehicle motor and other operational sounds of an emergency vehicle, including Doppler effect sound motion.
- Radio (intercom) system can be integrated into the driving station to enable two-way communications activity and training for the student driver through interaction with the instructor.



Washington DC Fire Department

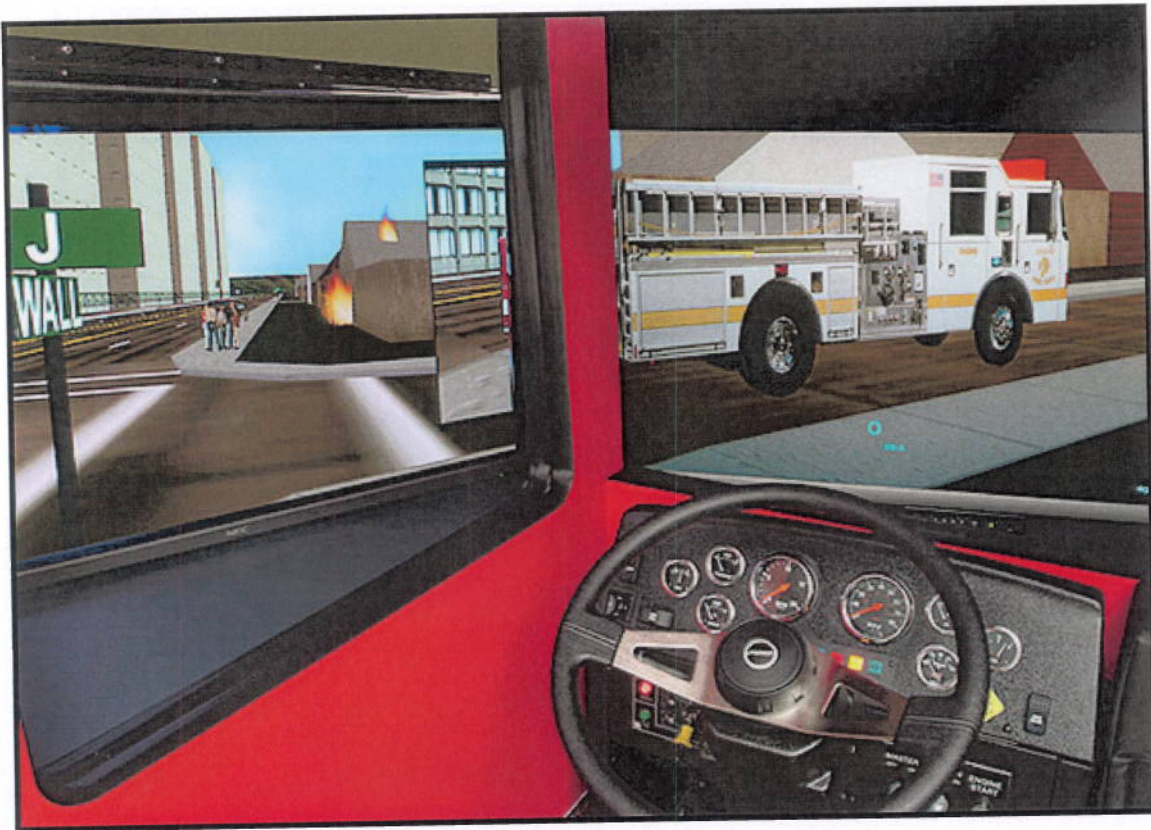


Washington DC Fire Department

Further information relating to this simulator can be found at www.faac.com

Doron

Doron's 460 Fire truck simulators replicate the driving compartment of a typical fire truck and are equipped with a push-button automatic transmission. The 460 Fire truck driving simulator includes essential components found in late model fire trucks, including air-brakes, tilt steering wheel, foot switch activated air horn and siren, air suspension drivers seat, Code 3 emergency lighting system and console, malfunction telltale panel, pneumatic pump switch, and optional two-way radio. Multiple 460 Fire truck driving simulators, or any combination of other emergency vehicles can be linked in create real-time scenarios enabling the development of team based skills and improving policy decisions.



Benefits

Training costs per student are reduced as much as 40%. Multi-station systems allow a single instructor to train many students simultaneously.

Since a major portion of driving tasks are learned and practiced in a simulator, less time is required in actual vehicles. Thus fewer vehicles are needed to complete behind-the-wheel (BTW) training.

Benefits

- ❖ Reduced insurance costs due to reduction in liability exposure
- ❖ Reduced maintenance costs since learners/operators spend less time in actual vehicles
- ❖ Reduced accident rates and accident damages and reduced vehicle repairs
- ❖ Reduced capital investment for vehicles
- ❖ Reduced fuel usage
- ❖ Training is standardised, therefore verifiable. Each student masters the same safe driving techniques in a controlled, safe environment.
- ❖ “Hands-on” student training/practice time increases.
- ❖ Fully interactive systems allow students to practice difficult manoeuvres repeatedly until mastered.
- ❖ Physical/ mechanical conditions (such as shifting) can be extensively practiced.

Safer Vehicles – Safer Drivers

- ❖ Potentially threatening situations and adverse weather/road conditions are “experienced” in complete safety.
- ❖ Perceptual and cognitive skills are learned and practiced.
- ❖ Student performance can be measured, recorded and assessed to provide guidelines for succeeding phases of driver training.
- ❖ Student and instructor time can be scheduled more efficiently.
- ❖ A 3-phase program (Classroom/Theory, Simulation and Behind-The-Wheel) requires less actual behind-the-wheel time, permits scheduling in complementary, segmented modules providing greater flexibility for scheduling the most time consuming and costly part of driver training: behind-the-wheel training.

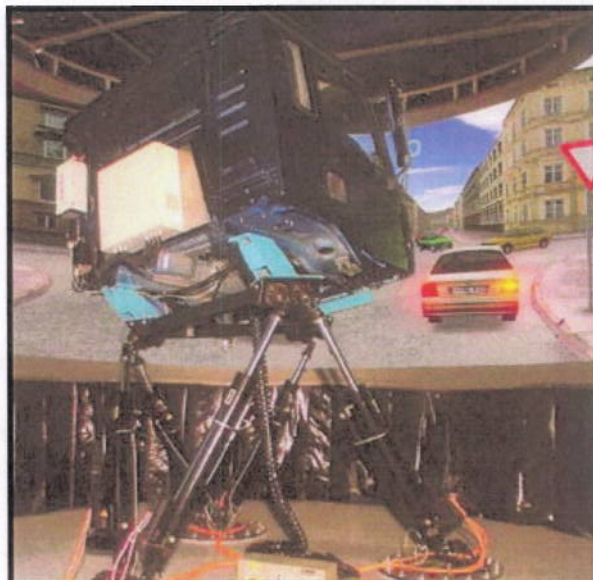
I am aware that this brand of simulator is in use by Montgomery County Fire and Rescue Service.

Further information relating to this simulator can be found at www.doronprecision.com

KMW

KMW is a German company who build purpose built simulators, specialising in military vehicles. I was advised that their simulators are very realistic, however also very expensive to purchase. Berlin Fire Brigade was negotiating the use of a simulator which is permanently located within a realistic travel distance.

The driver training simulators cover all aspects of basic driver training. The exact replica of the driver’s cab, along with connection to a multi-axis motion system, realistic noise simulation and seamless multi-channel projection guarantees a maximum of simulation reality.



Further information relating to this simulator can be found at www.kmwsim.com

Static / Mobile

I was made aware that most organisations with driving simulators tend to have them as static units. Fire departments in both Europe and USA had tried the mobile concept of taking the simulators to the students; however the constant movement in a moving vehicle highlighted major maintenance issues especially with the electronics. Those units permanently located within buildings have less maintenance down time.

10.5 Driving Aides

The large majority of departments visited, were using or trialling driver monitoring devices. The DriveCam system was the most popular device in use.

DriveCam / Smartdrive

DriveCam and Smartdrive are behaviour-based risk mitigation solutions that predicts and prevents actual risky driving behaviour likely to result in crashes.

The technology consists of a palm-sized, exception based video event recorder that is mounted on the windshield behind the rear-view mirror. Exceptional forces such as hard braking, swerving and collision cause the recorder to save critical seconds of audio and video footage immediately before and after the triggered event. This unbiased video evidence is downloaded wirelessly and reviewed by driver behaviour analysts who make recommendations for specific driver coaching.

Benefits

- ❖ Reduce costs & collisions by 30 to 90%
- ❖ Reduces the costs associated with unsafe driving behaviour
- ❖ Protects drivers and organizations by identifying collisions caused by third parties.
- ❖ Safer drivers on the road
- ❖ Reduce insurance premiums
- ❖ Proactive driver management
- ❖ Comply with Australian Privacy Regulations

Systems

There are several different systems available to suit varying applications.

1. Solely as a tool to identify driving behaviour issues or for collision investigative evidence. Customers can purchase and install the units and provide their own monitoring of the evidence.

2. A monitoring tool to keep track of driving behaviour to provide evidence to support driver education. The unit is monitored by Fleet Safe who provides feedback in accordance with customer requirements. This can be done daily, weekly, monthly, etc or after any activation.
3. A real-time monitoring and feedback solution to assist with driver education. It combines in-vehicle technology with integrated web applications for an advanced approach that continuously rates driving skills and safety levels. With feedback provided in the vehicle while driving, training occurs in real-time and safer driving is maintained through continuous reinforcement.

How does it work?

1. DriveCam captures a risky driving event.
2. The event is downloaded wirelessly to our Driving Risk Analysts.
3. Events are reviewed and a concise report with the video clip is delivered to the Fleet Manager.
4. The driver receives tailored coaching specific to their needs.
5. A safer driver returns to the road with greater awareness and improved driving behaviours.

Globally, DriveCam has a proven track record of identifying and improving risky driving behaviour and reducing property damages, workers' compensation and personal injury costs by 30 to 90 percent across 70,000 vehicles.

Information in relation to these devices can be obtained from the Australian distributor. It is worthy to note that several large Australian truck fleet are trialling these units at the moment. There is importantly, support from some unions for their use.

The Australian distributor is Fleet Safe. www.fleetsafe.com.au

Vehicle Data Recorders (VDR's)

Within both Europe and North America, ESO's are using or at least trialling VDR's. New vehicle are being ordered with them or some vehicle manufacturers are now fitting them as a standard feature or available as an option. In the USA, NFPA 1901 – Automotive Fire Appliance (2009 Draft Edition) requires all apparatus be equipped with an on-board VDR. The VDR shall be capable of recording the following data -

- ❖ Date
- ❖ Time
- ❖ Vehicle speed
- ❖ Acceleration (from speedometer)
- ❖ Deceleration (from speedometer)
- ❖ Engine speed
- ❖ Engine throttle position

- ❖ ABS Event
- ❖ Seat occupied status
- ❖ Seat belt status
- ❖ Master Optical Warning Device Switch

ESO's are using this data to either identify driver education issues requiring attention or as an investigative tool following a collision or near miss incident.

10.6 Lights and Sirens Training

I was advised that a requirement of the Occupational Health and Safety (OH&S) Act in the United Kingdom stipulates that training and assessments should be conducted in circumstances as close as possible to reality. As a result of this legislation, The London Metropolitan Police and London Fire Brigade both conduct training and assessment for drivers under operational response conditions with lights and sirens operating. This training is conducted under actual conditions within and around the Greater London area.

However, for London Fire Brigade to conduct this lights and sirens training, the vehicles must be fitted with DriveCam or similar systems. This is to provide evidence in the event of a collision.

Throughout the three days that I spent at Hendon, I observed as a passenger, two runs across central London whilst driving under "blues and two's".

10.7 Driving Policies

Each of the organisations that I visited had driving policies in force. There were however, a number of policies that I believe warrant further investigation or consideration.

Speed limits

Several years ago, CFA introduced a policy in relation to speed limits. This was based upon a similar policy in place with West Midlands Fire Brigade in the UK. Other services that have a similar policy are –

- Montgomery County Fire and Rescue Service - No vehicle under emergency conditions shall exceed the posted speed limit by 15 mph.
- California – 10 mph over the posted speed limit and must stop at red signals
- San Diego Fire Department – Posted speed limit within city limits and 10 mph over posted speed on freeways

Collisions

Unfortunately from time to time, ESO vehicles are involved in collisions. LA County and San Diego Fire Departments provide collision report forms on their vehicles. Of particular interest was an envelope within the package that was given to the other party/s involved. This information advised them what to do and who to contact regarding claims, etc.

Approximately 50 % of the organisations visited, stood drivers down after being involved in a collision. This period varied for each organisation from remainder of shift, 24 hours or until final investigative report was presented.

Alcohol / Drug testing

Another issue which can be very controversial is Alcohol and Drug testing. I am aware of several organisations that have policies in place

Washington DC Fire Department is currently investigating the option of performing random drug and alcohol testing.

Montgomery County Fire Department conduct urine testing on drivers involved in collisions where the damage is in excess of \$2500.00. Drivers are stood down with full pay until results are known.

10.8 Volunteer Fireman's Insurance Services (VFIS)

VFIS offers a wide range of valuable educational material, including books, CD-ROMs, posters, PowerPoint Presentations, and videos. Each program is accompanied by appropriate print and/or video materials.

From training to troubleshooting, VFIS helps emergency service organisations become better prepared for every call, reducing the risk of injury or loss to the people they serve, the property they protect, and their most valuable asset—their members.

I was fortunate to be introduced to Mr Michael Young from VFIS and had the opportunity to visit him at their Headquarters in York, PA. VFIS through Michael donated a significant amount of learning material which will be used as appropriate to support existing materials.

11. Safety / Environmental

11.1 Seatbelts

The wearing of seatbelts is a topic that is constantly discussed within fire services around the world. Unfortunately, firefighters have been too slow to recognise and react to the dangers associated with not wearing seatbelts, especially in off road situations. In the USA, approximately 25 % of all fire-fighter deaths are associated with driving or operating vehicles. The majority of these deaths could have been prevented if seatbelts were being worn.

To highlight the challenge facing Fire Departments in the USA, I refer to a seat belt pledge campaign currently being promoted.

Firefighter Christopher Brian Hunton, age 27, was a member of the Amarillo Texas Fire Department for one year. On April 23, 2005 he fell out of his fire truck responding to an alarm and died two days later from his injuries. Brian was not wearing his seat belt.

The Amarillo Fire Department decided that they would lead a national campaign to highlight the poor culture amongst the nation's emergency responders. Their goal is for the nation's 1.2 million firefighters to commit to this pledge. As of August 2008, only 58,700 firefighters in the USA have signed the pledge. This is less than 5% of all firefighters.

Brian Hunton: National Fire Service Seat Belt Pledge

Firefighter Christopher Brian Hunton, age 27, was a member of the Amarillo Texas fire department for one year. On April 23, 2005 he fell out of his fire truck responding to an alarm he died two days later from his injuries. Brian was not wearing his seat belt. I pledge to wear my seat belt whenever I am riding in Fire Department vehicles. I further pledge to insure that all my brother and sister firefighters riding with me wear their seat belts.

I make this pledge willingly; to honour Brian Hunton my brother Firefighter and because wearing seat belts it is the right thing to do. On My Honour, I So Pledge:

Department _____ Address _____

Signature _____ Print Name _____

Signature _____ Print Name _____

Signature _____ Print Name _____

Signature _____ Print Name _____

Signature _____ Print Name _____

Signature _____ Print Name _____

Signature _____ Print Name _____

Signature _____ Print Name _____

I was unable to gain any statistics from within Europe, however all departments stated that the wearing of seatbelts is a challenge in relation to compliance with legislative and internal policy.

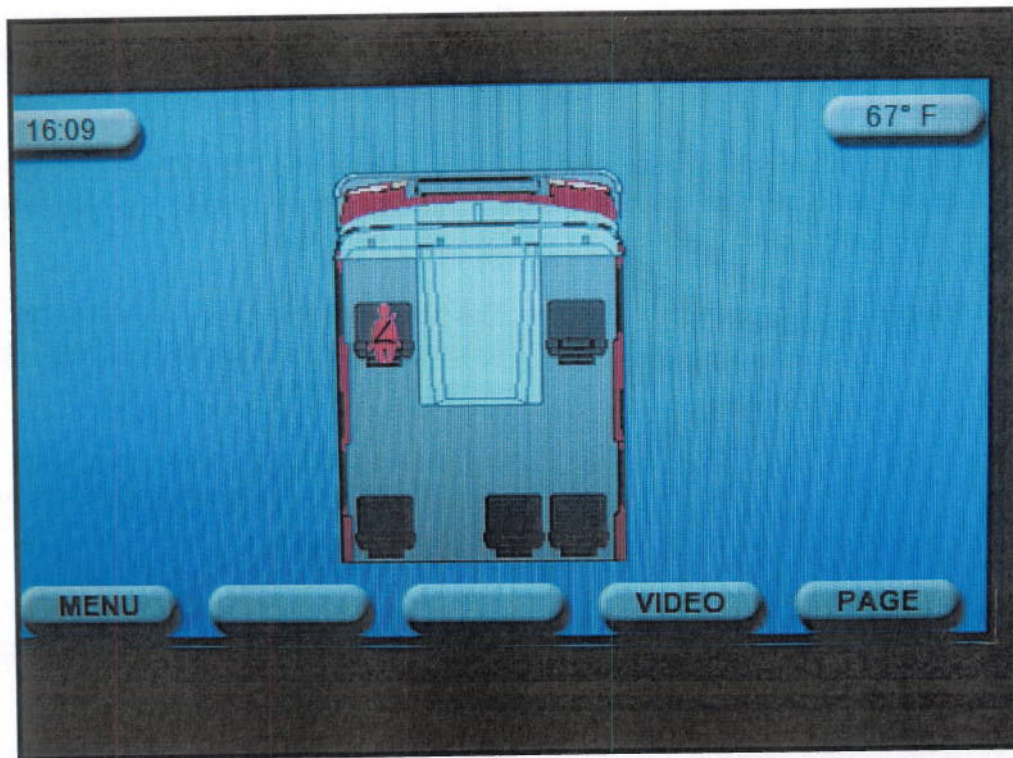
All organisations that I visited had a written policy in relation to the compulsory wearing of seatbelts. However all admitted that compliance is a major issue. There are varying solutions being considered or have been implemented, such as –

- Crew leader checks Before a vehicle goes into motion, the crew leader must ensure that all occupants are wearing seatbelts
- Fines Individuals who do wear seatbelts are fined as are crew leaders who do not enforce seatbelt wearing
- Visual warning system Visual warning indicating to driver that one or more occupants are not wearing seatbelts
- Audible warning systems Audible warning indicating to all within cabin that one or more occupants are not wearing seatbelts
- Visual and audible warning systems A combination of visual and audible systems
- Park brake interlock systems A system that does not allow the park-brake to be released unless all occupants are wearing seatbelts.

Firefighters and emergency service personnel in general are masters at innovation and overcoming hurdles placed before them. Several organisations stated that they have trialled several options before finding the solution. Many of the systems operate by recognising that a person (weight) is on the seat and that the seat belt has not been buckled. To overcome this warning, some firefighters buckled the seatbelt and then sat on the seat. This tricked the system and allowed them to travel without wearing a seatbelt. To overcome this situation, the system now has to recognise a weight first and then the buckling of the seatbelt.

A problem with the park-brake interlock system is that in the event of a fault with the seatbelt system, the vehicle becomes disabled and cannot respond to emergencies.

The following picture shows a system installed by Pierce in the USA. It gives a visual and audible warning to the driver and crew leader as to the status of seatbelt wearing by all cabin occupants.



Pierce System

There are other options available to ESO's in relation to improving the compliance of wearing seatbelts.

Research and feedback from end users has led to red seatbelts becoming compulsory in the USA. Scania trucks now provide red seatbelts on their 'fire' version crew cabs.

Another option is the use of integrated seatbelts into individual seats. Research both here in Australia and around the world supports that seatbelt compliance is higher where integrated seatbelts are fitted.

11.2 Ladder Gantries

A challenge for all ESO's that use ladders has been their stowage and accessibility. There were two designs that I observed that I believe could be easily adapted to our vehicles. The first is a European design which is similar to those already used with Australia. The second is a USA design that has many OH&S benefits.

European design

This design which is standard on most European Pumpers features a ladder stowed on the roof of the vehicle. The ladder is stowed on a sliding rail system on the off side of the vehicle.

Safer Vehicles – Safer Drivers

Being off to one side assists in keeping it clear of the pump operator if removed whilst pumping operations are in progress. The handle which is secured to the body at the rear can be adjustable to suit firefighters of all heights.



Pumper – Frankfurt Fire Brigade

After releasing the safety catch, the ladder is pulled back on its rails by the vertical handle. Upon being fully retracted the Firefighter pulls the handle down allowing the ladder to be ready accessible.



Pumper – Frankfurt Fire Brigade

Safer Vehicles – Safer Drivers

USA design

There were several designs that I observed during my visits within the USA, however I believe that this design has more merit.

The design features hydraulic brackets with stores the ladder and other equipment on the roof of the vehicle. An electrically operated control allows the ladder to swing down to shoulder height allowing easy removal at a suitable height.



Las Vegas Fire Department

11.3 Exhaust Extraction Systems

All ESO's in Australia have many vehicles in their fleet being powered by diesel engines. There is an increasing awareness of the risks associated with diesel fumes and the health concerns for emergency service personnel working around these vehicles. It is well documented that the health effects of diesel exhaust of both long and short term exposure include:

- Premature Death
- Lung Cancer
- Heart Attacks
- Testicular Cancer
- Chronic Bronchitis
- Neurological Damage
- Liver/Kidney Damage
- Aggravated Asthma
- Exacerbated Allergies
- Lower Resistance - Respiratory Infections

Some ESO's in Australia have fitted various exhaust extraction systems in the motor rooms. My visits to Fire Stations in both Europe and North America revealed various vehicle exhaust extraction systems in use. As with most technologies, there is differing advice on the most suitable system.

Not only do we need to remove the exhaust fumes from motor rooms, we also need to ensure that it doesn't spread to other locations within our buildings. Training rooms, eating locations and rest and recline areas are all exposed if fumes are not captured at the exhaust system.

There are various systems that are available.



Vehicle Exhaust Hose Reels



Fixed and Suspended Drops

Safer Vehicles – Safer Drivers



Suspended Flexible Drops

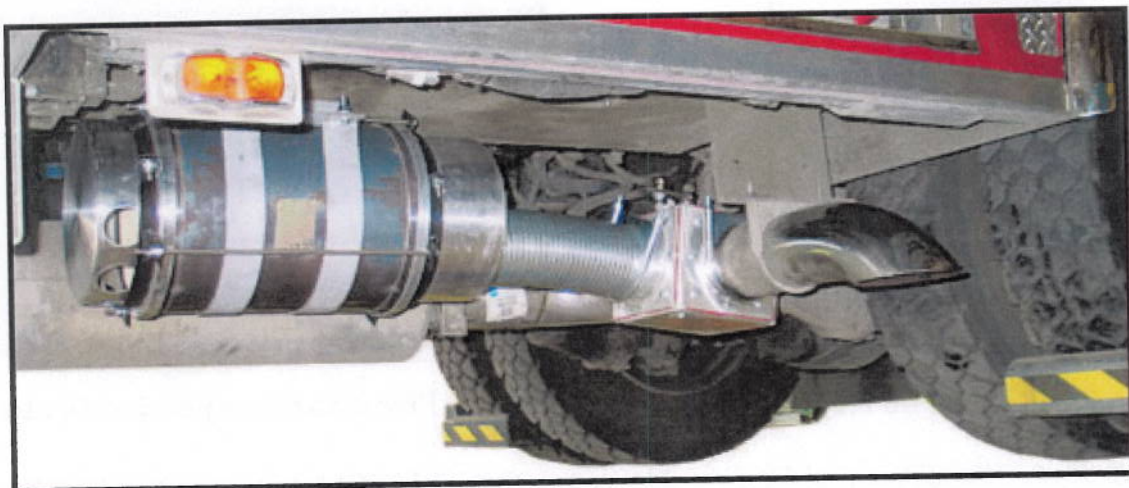


Vehicle Exhaust Rails

In addition to those systems above, I was keen to investigate a different system from Wards Diesel. I was aware of this system prior to my tour; however I was able to meet with a company representative at the Fire Rescue Expo in Las Vegas.

The system involves the fitting of a filter canister to the existing exhaust system on vehicles. Its advantages include –

- ❖ Operates almost immediately upon start-up
- ❖ Catchment of particulate at source of emission
- ❖ No disconnection issues
- ❖ Not relying on personnel connecting flexible hose systems to the vehicle exhaust.
- ❖ No noise associated with use
- ❖ If fitted to all vehicles, no standby vehicle issues associated with connection to differing exhaust systems



The following information is taken from their web site. www.warddiesel.com

The system consists of a ceramic substrate, a diverter unit and an electronic control module, all of which are completely self-contained on the vehicle. Therefore the system may be operated at any time, regardless of the vehicle's location.

The diverter unit is installed in the existing exhaust pipe and shall direct the engine exhaust either through the substrate or through the muffler. The diverter is operated by a double acting air cylinder controlled by an electrically activated, four-way, single solenoid valve.

The system reduces gaseous matter from the exhaust for an adjustable time period of 10 to 99 seconds after the vehicle starts. This is to provide ample time to start the vehicle and move away from the building. The time of system operation shall be easily set by a mechanic or service person with common tools.

The system also reduces gaseous matter from the exhaust whenever the vehicle is in reverse gear. After the vehicle's transmission is shifted out of reverse gear the system will continue to operate for the pre-set time period.

This will provide ample time to back the vehicle into the building and shut it off. A manually operated switch also allows the driver to activate the system when returning to stations with drive through facilities or when operating at scene and personnel are working within the exhaust area.

11.4 Vehicle Steps

Getting in to and more so, getting out of heavy vehicles has caused many injuries over the years. The introduction of Breathing Apparatus into the rear seats of firefighting vehicles has required firefighters to exit from the cabin, normally backwards, down vertical steps.

This system below is being used by Rosenbauer and allows firefighters to exit the cabin using a normal stepping motion.

The step rolls out in line with and is supported by the cabin door. This concept warrants further investigation amongst Australian Emergency Services as I believe it has the potential to reduce workplace injuries.



Rosenbauer

12. Acknowledgements

I wish to formally acknowledge the following persons and organisations for their valued assistance in helping me achieve my tour objectives –

AssetCo	Mr Jim Parker
AssetCo	Mr Steve Offley
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Big Bear Lake Fire Department	Captain Rick Flint
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Bronto Skylift (Finland)	Mr Heikki Hyoki
Calfire	Bill Peters – Fire Prevention Specialist
Calfire	Fire Chief Tom O’Keefe
Country Fire Authority	(ex) DCO Craig Lapsley
Fairfax City Fire Department	Assistant Chief Tim Butters
Fairfax County Fire Department	Lt Michael Whetsall
Fairfax County Fire Department	Lt Sean Evans
Frankfurt Fire Brigade	Mr Wolfgang Kindler
Frankfurt Fire Brigade	Mr Maik Billino
London Fire Brigade	Training Manager Steve Curley
London Fire Brigade	Watch Manager Stuart Butler
London Metropolitan Police	Chief Inspector Don Smith
Los Angeles County Fire Department	Captain Mike Brown
Los Angeles County Fire Department	Captain Tony Duran
Los Angeles County Fire Department	Firefighter Jason Robertson
Metz Ladders (Germany)	Mr Atcham Nyack
Montgomery County Fire Department	Battalion Chief Shane Darnick
Montgomery County Fire Department	Battalion Chief Barry Reid
Montgomery County Fire Department	Captain Neil Treves
North Vancouver Fire Department	Captain Warren Chow
North Vancouver Fire Department	Deputy Chief Tony Delmonico
Rosenbauer (Australia)	Mr Ken McEwan SASGAR
Rosenbauer (Austria)	Mr Christian Spindle
Rosenbauer (Austria)	Mr Gottfried Reiter
Rosenbauer (Austria)	Mr Wolfgang Voraberger
San Diego Fire Department	Fire Station 26
Scania (Australia)	Mr Dean DalSanto
Scania (Sweden)	Mr Jukka Vuorenmaa
Stockholm Fire Department	Anders Johansson
Strategic Safety Solutions	Mr Ray Shuey
VFIS	Mr Michael Young
Washington DC Fire Department	Captain David Kirkpatrick
Washington DC Fire Department	Deputy Fire Chief John Burger
Washington DC Fire Department	Lt Tim Jones

Safer Vehicles – Safer Drivers

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