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Ultrasonic Tranducer of the SONAR Unit
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MARCH 2016 • ISSUE 49

Cover image: When the safe deployment and use of a high volume masterstream appliance is required, portable monitors such as the Crossfire shown, incorporate an integrated safety shutoff mechanism to avoid unintentional and unwanted movement during operation. Image courtesy of Task Force Tips.

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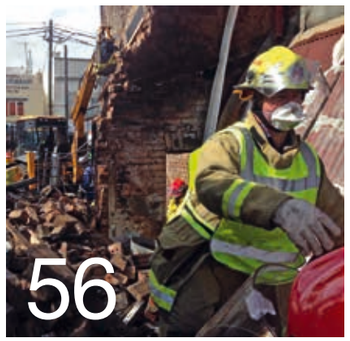
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Critical Operations Raises Global Profile



Lt. Colonel Expert Ali Hassan Almutawa FIFireE
Director of Operations Department – Dubai Civil Defence

Having been recruited in 1998 as a Corporal Watch Commander deployed at Al Qusais fire station, a key station in the developing Dubai, my role was multi-functional and included writing new training and development policies for operational crews, together with setting fire safety inspection regimes and controls for the Risk profile around Dubai. Operationally I was involved in many major incidents often being tested at an early stage as to my suitability for progression through the ranks as a potential strategic officer.

In 1999 I was selected for an international fire officer training program in Toronto, Canada where I successfully gained my first degree in '*Fire Science*' and a diploma degree in '*Fires in Airports and Seaports*'.

In 2000 I was appointed as a District Officer taking charge of many incidents as the initial incident commander, whilst still continuing with my studies, my appetite was there for an intense career in Civil Defence and the protection of life and property. In 2002 I was appointed as a Station Director focusing on policy writing for operations, communications and training.

As the new operations control room was being developed and expanded in 2005, in order to keep pace with the rapidly developing Dubai, I was deployed as the Senior Group Officer responsible for staffing, training and equipping the control suite.

After graduating with a bachelor degree in '*Law*' from Dubai Police Academy in 2007 and attaining another diploma for '*Operations Room Management*' from Germany in 2014, I was further promoted to the rank of Senior Director of Operations, in charge of the department.

Dubai's dynamic profile is evolving at incredible pace with the risk footprint constantly changing. We live in a very exciting vibrant country and our unique city is full of expression and ambition – a densely populated, multi-cultural environment embedded with a sentiment of satisfaction and safety.

Such growth and a constantly changing skyline, the Civil Defence mission is to keep pace with the uniquely challenging structures and designs whilst ensuring the skill development and technical requirement provides a benchmarked, yet smart resilience, whilst uniquely striving to be one of the safest cities in the World.

Those that have visited Dubai will understand the label of '*smart city*' and we at Civil Defence are continually seeking for '*smart solutions*' with an endeavor to remain at the leading edge of technology and skill development so we can protect our environment. From firstly advising architects and designers with fire engineered solutions and agreeing on a core '*brand protection*' philosophy, through an integrated building management system for early detection and alerting to a dedicated set of operating procedures that sets out best practice tactics and tested interoperability with all emergency agencies and stakeholders.

We have been extremely busy with awareness and educational campaigns targeting sectors that required some additional efforts, with a concentration of closely monitored interactive drills and exercises giving direct advice to the recipients whilst at the same time testing our response and command structures. These measures are now showing positive results not just from a learning platform but operationally now we have been tested and we are delighted to see direct successes. This doesn't mean the job is done, in fact far from it, we will continue to improve and to strive for higher excellence through further learning, research and development.

Having recently been decorated for actions in several incidents as Incident Commander and receiving an award for achievements as a dedicated Civil Defence Officer, who has made a positive impact in the Organisation by always welcoming and sharing knowledge through best practices with International partners and Organizations. This included promoting the joint cooperation and policy sharing between Dubai Civil Defence and key international fire and rescue authorities aimed at sharing knowledge. I have also been extremely supportive towards the establishment of the UAE GCC IFE branch, and am enthusiastic in developing the local branch activities not only within the Dubai Civil Defence but across the Emirates in all sectors.

Based at the Dubai Civil Defence Headquarters, I will always extend a friendly welcome for any visitor who has a wish to share experiences, whilst modestly showing the successes of the Dubai Civil Defence Fire and Rescue Departments with of course my fellow Commanders and Officers keen to meet and discuss with any Civil Defence or Fire and Rescue colleagues.

News

Serco trains UN firefighters based in Afghanistan

Serco's International Fire Training Centre (IFTC) in Teesside, UK one of the world's leading aviation fire training centres, has recently trained a delegation from the United Nations (UN) fire safety leadership team based in Afghanistan.

The senior UN fire officers underwent two weeks of intensive aviation fire training at the Centre, which is based at Durham Tees Valley Airport, near Darlington in December 2015.

The UN fire safety team in Afghanistan provides firefighting cover to regional and provincial air terminals, air fields and Helicopter Landing Sites across the country. The diverse team is made up of fire officers from various UN member states including the USA, Philippines, Uzbekistan and France.

ITFC's experts provided the group with a mixture of theoretical and hands-on training, which covered crash rescue and incident command for both fixed and rotary winged aircraft.



Image courtesy of Serco

The UN team described the facilities as "excellent", praised Serco staff - in particular their lead trainer, Walter Moore who "epitomises professionalism" - and plan to send more firefighters to the Centre for training in future.

Alonzo Baldwin, one of the UN fire officers on the course, commented: "The way IFTC can combine theoretical training with a full blown exercise makes it a truly world-class facility in firefighting."

Serco's Gary Watson, Business Operations Manager for the IFTC, said: "Teesside is a far cry from Afghanistan, but our unique facilities enable us to train firefighters from around the globe for all eventualities. It was a real privilege to support the UN team who operate in a life protecting role in one of the world's hot spots. We are delighted that they found the course of such great value."

IFTC currently trains around 10,000 delegates from around the world each year. Its experts are firefighting professionals with extensive hands-on experience across military, industrial and civilian ranks.

For more information, go to www.serco.com

Pierce Manufacturing at FDIC Exhibition

Pierce Manufacturing, the leading North American manufacturer of fire and emergency vehicles, will display a total of 18 fire and emergency apparatus – and demonstrate new technologies – during the Fire Department Instructors Conference (FDIC) Exhibition in Indianapolis from April 21st – 23rd 2016.

Pierce maintains its central hub location at the entrance of Lucas Oil Stadium (LOS) where, this year, it will feature 11 vehicles, including a wide range of pumper, aerial, and rescue apparatus. A second Pierce booth, showcasing five apparatus, will be located at stand #5521 in the Indianapolis Convention Center. Two additional apparatus will be on display outdoors.

The company will hold an event at LOS on Thursday, April 21st at 1:00 pm to introduce the vehicles and exciting new technologies on hand.

For more information, go to www.piercemfg.com



Image courtesy of Pierce Manufacturing



POK – Celebrating 40th anniversary at FDIC International

POK SAS is the leading firefighting equipment manufacturer in France. POK is known worldwide for its wide range of hand nozzles, manual and remote controlled monitors, foam equipment, trailers and hose reels – in total overall 4,000 products which are all manufactured in France.

POK products are designed to meet the needs of fire brigades and the company also manufactures a wide range of equipment for fire trucks. POK supplies local authorities, chemical, oil and gas and high explosive risk sites, as well as airports, buildings, road transport markets and last but not least Army, Navy and Air Forces around the world. For example, storehouses, petroleum refineries, and fuel containers need high expansion foam generators and very powerful monitors, which POK develops for fixed installations as well as portable or trailer mounted.

POK supplies specific hose reels such as: pneumatic mobile hose reels for tunnels, earthquakes-resistant hose reels for nuclear power stations, and customised hose reels for the Navy. The company equips waste incineration plants with remote controlled monitors, and water supply and sanitation services with valves and strainers. POK manufactures different types of fittings for customers in more than 90 countries.



What makes POK different is their commitment for high quality and robust equipment. POK is a DQS UL listed company and has 40 years experience in the safety field, working closely with fire brigades all around the world. POK designs and produces equipment with the end user in mind and all products are compliant to the necessary standards. POK understands the high-level demands of firefighting brigades and takes them into account – they have also developed specific equipment adapted for salty and corrosive environments. The company serves their customers well by knowing both their needs and demands. POK designs products that can be easily maintained or repaired in the customers own workshop instead of having to ship them back to the factory. You can save both time and money! Alternatively, POK can provide the customer with service and maintenance in POK's facility. The after sales service team is happy to teach you how to undertake your own maintenance and provide you with the necessary maintenance kit.

POK has a research and development office to design and manufacture products according to customer's needs as the company is keen to solve your problems and help you. Sometimes, small changes can be easily made in the company's workshop at no extra costs – please do not hesitate to ask if they can "easily do it".

Finally, during the Firefighting Combat Challenges, you may have noticed the POK nozzles in use. During the challenges, the nozzles are regularly thrown to the ground every 3 minutes or so. POK's nozzles are the only ones to be used throughout the challenge without having to repair or change the nozzle. The reason why POK nozzles are so widely used in the USA and elsewhere is because they show an exceptional shock resistance and are made to last.

POK are looking for distributors in the USA. Please visit them on booth 5649 at FDIC, Indianapolis where they will be pleased to show you their best sellers like the latest Montmirail self-oscillating monitor. To book an appointment please contact pascal.cambournac@pok.fr

For more information, go to www.pok.fr/en



Avon Protection acquires Argus

Argus thermal imaging cameras were acquired by Avon Protection in 2015 to broaden Avon's range of products on offer to the fire and first responder markets worldwide. As a world leader in CBRN PPE and respiratory protection, Avon Protection provides complete solutions for air, land and sea based personnel in military, law enforcement, first responder, fire-fighting and industrial sectors worldwide.

Argus thermal imagers are a well-established and innovative leader in the hand-held thermal imaging market and are an excellent addition to the Avon Protection product portfolio. The intelligent design, excellent image quality, and breadth of products allows us to continue to offer the best quality products to customers.

The new Argus Mi-TIC S thermal imager now live

Avon is now manufacturing and shipping the new Mi-TIC S thermal camera to fire fighters around the world.

With the most features as standard, the Mi-TIC S is the lightest, safest camera around with Dynamic Scene Enhancement (DSE) ™. The Mi-TIC S ensures firefighters don't need to compromise when it comes to safety.

Simple and rapid one hand operation and the clear, easy-to-use interface allows full understanding of a fire scene and better-informed decision making.

Available as standard with a 2 year warranty and options to extend, the Mi-TIC S gives the lowest cost of ownership on the market, and is the sure-fire thermal imager for firefighters around the world.



© Images courtesy of Avon Protection



Avon's Deltair® – the most innovative SCBA available, designed by firefighters for firefighters

Avon's successful Deltair SCBA has been developed to meet and exceed the standards for Open-Circuit Self Contained Breathing Apparatus for Emergency Services.

Developed to deliver the same ruggedness and reliability that we put into all our respiratory products, Deltair has been tested to a variety of NFPA, NIOSH, and Mil Spec standards to ensure it meets and exceeds the tough demands required by the fire service.

For more information, go to www.avon-protection.com



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Gulf Fire



Gulf Fire Magazine is the only quarterly journal specific to the Middle East Fire market dedicated to both fire protection and firefighting. The editorial features are written by industry experts and comprise a unique blend focussing on the latest technology, training methods and equipment as well as highlighting sector specific issues. Regular product and company profiles, events updates and news make Gulf Fire Magazine the first choice read for fire protection and firefighting professionals.

www.gulffire.com



APF ASIA PACIFIC FIRE MAGAZINE

APF Magazine is the only quarterly journal for the Asia Pacific fire market dedicated to both fire protection and firefighting. Written by leading fire prevention and fire fighting professionals, every issue is packed with in-depth technical features and the most recent developments in testing, codes and standards. Regular product and company profiles, events updates and news make APF the first choice read for fire, rescue and safety professionals.

www.apfmag.com

IFP INTERNATIONAL FIRE PROTECTION MAGAZINE



IFP Magazine is the only international journal dedicated to fire safety, prevention and protection covering every aspect of the passive and active fire protection market. The editorial features are written by industry experts and comprise a unique blend focusing on the latest technology and equipment as well as highlighting sector specific issues from around the world. Regular product and company profiles, events updates and news make IFP the first choice read for fire safety professionals.

www.ifpmag.com

Written by Fire Professionals for Fire Professionals

Panthers spotted on the Faroe Islands

RK Brand & Teknik A/S in Denmark has delivered a pair of compact Rosenbauer Panther "S" airport crash tenders to Vaga Floghhavn Airport on the Faroe Islands.

RK Brand & Teknik A/S worked closely with the customer and Rosenbauer International AG to deliver these stunning airport fire tenders built exactly to the customers' requirements. Vaga Airport were actively involved throughout the planning and manufacturing process of the trucks, which in-addition to staged visits to the factory also included a two week training and familiarisation package at H.C Anderson Airport in Odense plus a full day at the DEKRA proofing ground facility – prior to their delivery to the Faroe Islands.

The identical Panthers are built on a 2.5 metre wide Rosenbauer Motors 6x6 chassis specified with a Volvo D6 700 hp Euro 5 diesel engine and Twin Disc automatic transmission. The crew safety cabin accommodates a driver and 3 crew and is fitted with HO Bostrom seats with SCBA mountings for the driver plus one crew member.

The tender carries 9,100 litres of water, 1,200 litres of foam plus 200 kg of DCP. The Panther makes use of the Rosenbauer Logic Control System (LCS) and were specified with a Rosenbauer RM60E remote roof mounted monitor delivering 6,000 LPM, a Rosenbauer RM15C bumper turret delivering 1,500 lpm, a Rosenbauer R600 low pressure pump rated at 6,000 lpm plus two rapid response hose reels.


© Martin H Pedersen – Brand & Teknik A/S

These new Rosenbauer Panthers will replace 2 x Volvo airport crash tenders dating from 1995 and 1997 which will be re-deployed to H.C Andersen Airport.

For more information, go to www.brandogteknik.dk

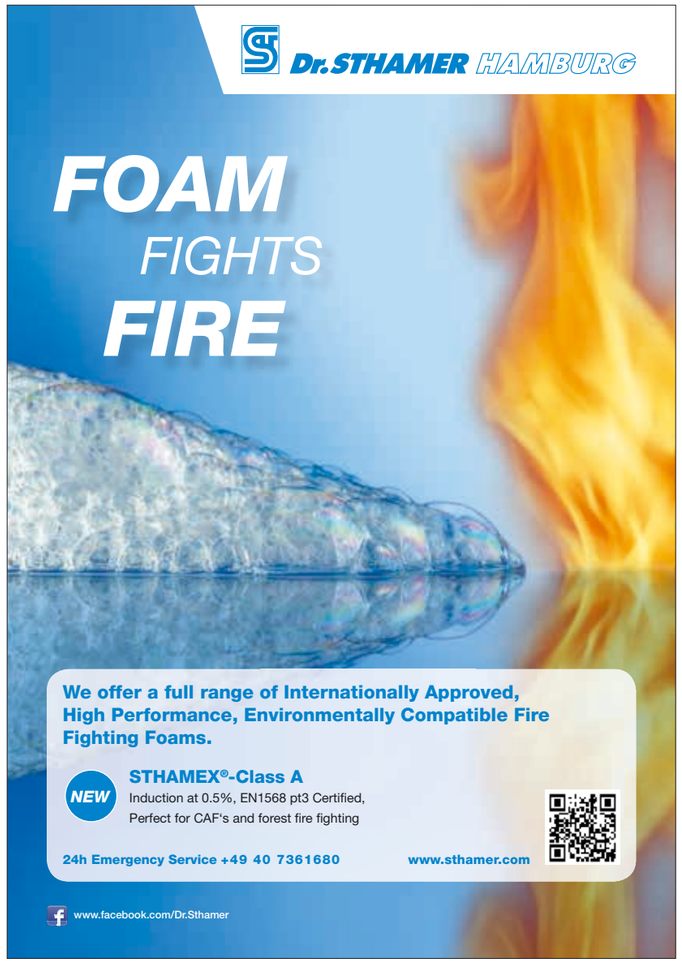
IAFPA – Asia

International Aviation Fire Protection Association (IAFPA) has recently set up a regional headquarters in Singapore to better serve the Asia Pacific region. The regional centre aims to help to promote International Civil Aviation Standards in Aircraft Fire Fighting and Rescue and to promote closer co-operation between the various Emergency Responders by interactive programmes which will be held at locations across Asia Pacific and the Middle East.

IAFPA Asia will be helmed by Cletus Packiam, Fire Chief at Airport Emergency Services (AES) at Changi Airport Group (CAG).

Membership is open to individuals as well as corporates. A joining fee of S$20.00 in addition to an annual subscription of S$100.00 for individuals and from S$3,000.00 for corporate members will be applied.

For more information, go to admin@IAFPA.asia



Ziegler Z6 for Sofia Airport

The Sofia Airport in Bulgaria recently received a Ziegler Z6 with Z-Attack Turret. The vehicles specification is FLF 80/120-14 Z-Attack.



Ziegler Z6 for the Airport Sofia in Bulgaria

This special Z6 is built on a Type ZT3670 6x6 Thomas Chassis and powered by a 700 HP Volvo R-6-cylinder diesel engine with common rail injection, turbocharger and intercooler. The vehicle is equipped with a Ziegler FPN 10-8000-1ML centrifugal fire pump and a foam system with Electronic Automatic Dosage Unit.

The pump system is powered by the vehicle engine using a connectable TWIN-DISC Power Divider. The firefighting capabilities include 12,000 litres of water and 1,400 litres of foam. The front turret delivers 1,600 litres per minute (lpm).

In addition a training simulator was specially developed to the customers' specifications for training firefighters how to master extinguishing techniques of the Z-Attack.

This is the first ZIEGLER Z-Class vehicle which has been delivered with the Z-Attack High Reach Extendable Turret (HRET). The Z-Attack was designed in-house by Ziegler and will be produced at the factory in Giengen, Germany.

ZIEGLER Z-Attack HRET

The technical data and advantages of the Z-Attack;

- Maximum range of 17/20 meters
- Outreach of 12/14 meters
- Delivery rate up to 6,000 lpm, extended 4,000 lpm
- Additional extinguishing agents
- Optimal backslash-free positioning of erecting cylinder
- Accurate position indicator on the display for the operator through cylinder integrated position indicator
- Driving with extended Z-Attack possible up to 15 km/h
- Rapid square-off of the desired attacking position (ca. 6 sec)

For more information, go to www.ziegler.de

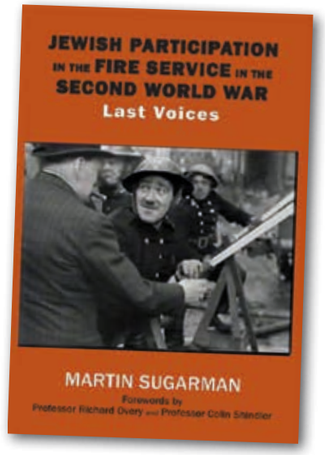
Last Voices by Martin Sugarman

Here for the first time author Martin Sugarman documents the essential part played by Jewish personnel in the Fire Service in the Second World War. Ever civic minded, Jews from all social backgrounds were pre-war volunteers to be trained for dealing with the expected mass bombing of cities by the Germans. After war was declared, by 1940–1 many younger Jewish men and women volunteered or were called up to the armed services, whilst many who were too old or unfit for the military stayed on with the Fire Service.

This considerable number of Jewish firemen and women played a major role in the civil defence of Britain. Some won bravery awards, including the only George Cross – the highest civilian award for courage – won by a London Fireman during the war. Many gave their lives; this is their story.

The author has captured part of this extraordinary contribution of daring, effort and suffering through the use of archival material, books and personal 'Last Voice' interviews, while numerous, never-before-published, photographs illustrate and illuminate the text.

The book contains 500 pages, 280 photographs and as a special offer readers of IFF can purchase the book for £30 / $65 (normal retail price £35.00/$74.95). To order please email info@vmbooks.com and quote IFF2016 for a proforma invoice. Offer valid until April 29th 2016.





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MetalCraft Marine

Congratulations to FDNY on the completion of their new FireStorm 70

FDNY has had a long history of serving the needs of their community dating back to 1648. It wasn't until 1865 that the modern-day Fire Department was first established. The professional force was needed to better provide protection to the fast-growing and increasingly complex metropolis. The first reference to the nomenclature F-D-N-Y was made in 1870.

This particular version of MCM's 70 footer is scaled down slightly to fit the needs of FDNY. Our traditional FireStorm 70 is four feet wider, slightly longer and has a much larger cabin/tool room. MetalCraft Marine Incorporated is a fully integrated designer and manufacturer of custom high performance fire, rescue, patrol, research and other specialized work boats. MCM was established in 1987 and is a World leader in aluminum high speed, high pumping craft. With over 630 hulls built to date, in service vessels include Boston, Port of Houston, Washington DC and Miami Fire Departments along with US Coast Guard, US Navy, Panama Canal Authority and many other Ports around the Globe.

"The name of the new boat "William M. Feehan" holds special meaning to FDNY. First Deputy Commissioner Feehan was killed on that fateful morning terrorists flew hijacked jetliners into the twin towers on Sept. 11, 2001. At 71, he was the oldest of the 343 FDNY members who perished.

Feehan was a blaze-battling legend in his own time, heralded for his intuitive knowledge and cunning in fighting fires. He was thought to have known the location of every fire hydrant in the Big Apple and remains the only FDNY member to have held every rank in the department, from probationary firefighter on up to fire commissioner. The name plate held high on along-side the cabin of their new fireboat is milled from an I-beam lifted from the rubble and ruin of the World Trade Center over 14 years ago.

"He was a fireman's fireman," Salvatore Pastore said over the phone from Brooklyn. Pastore is a lieutenant with Marine Company 6 as well as FDNY liaison with MCM for the new boat.

"We'll never forget any of the firefighters we lost that day," noted 28-year veteran Pastore. "But this lets 'Chief' Feehan's family know that we're remembering him in a special way."

"Working with the FDNY team on the build of the William M. Feehan has been a tremendous honor for us at MetalCraft. With the input of the FDNY personnel, we have implemented several new features on this fireboat. The FS70 is our flagship vessel, and the William M. Freehan is undoubtedly our most advanced one to date," commented Michael Allen, MetalCraft's General Manager. "We hope the FDNY and people they protect will benefit from this vessel for many years to come."

MetalCraft's Project Manager Jay Milner said "It has been a great pleasure working with the FDNY organization, their knowledge of both the Marine and Firefighting aspects combined, has made this vessel a one-of-a-kind machine. I have thoroughly enjoyed every step of the process and have learned from them during the course of the build. Wishing them all the best and stay safe."

The William M. Freehan sailed from MCM via Lake Ontario to the Erie barge Canal, down the Hudson and out at NYC. The journey took 4 days and had a huge welcome upon entering the New York harbor on October 12, 2015.

FDNY Marine Companies are the New York Fire Department's fireboats and are tasked with SCUBA/Dive Rescue and off-land firefighting in New York's rivers and harbors. The FDNY's three Marine Companies operate large fireboats and smaller, secondary rescue boats to respond to various marine-related emergencies.

For more information, go to www.metalcraftmarine.com

▼ **The newest member of New York's Bravest will be christened *William M. Feehan*.**



© Image courtesy of MetalCraft Marine

MetalCraft Marine
INCORPORATED

MCM is the industry leader in designing and building custom aluminum high-speed fire and rescue boats. The FireStorm has a rich history of delivering quality harbor security and first response vessels to many major ports and harbors.





Top: FireStorm 40, Melbourne Fire Brigade, Australia.
Above: FireStorm 50, Kuwait City Fire Services, Kuwait.
Below: FireStorm 50, Rio de Janeiro Fire Department, Brazil.

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COMPANY PROFILE

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Rio Tinto Iron Ore (RTIO) operate numerous mine sites around the thinly populated Pilbara region of Western Australia. These remote mine sites are operated as Fly In/Fly out (FIFO) operations which is a method associated with flying personnel to remote mining operations in Australia for a short period of time instead of permanently relocating the employee and their families. Rio Tinto operate specific key airports to transport personnel to work on this basis.

The largest of these Fly in/Fly out sites is Boolgeeda Airport (YBGD) which has existed albeit originally with a dirt runway – since the 1950`s. In recent years the airport and its facilities have been significantly upgraded with a range of closed charter aircraft including Fokker 100, Boeing 737 and Airbus A320 now flying FIFO personnel direct to the airport from Albany, Perth, Busselton and Geraldton airports on a daily basis

▼ Originally a dirt runway Boolgeeda Airport has been significantly upgraded to accommodate modern aircraft.



Image courtesy of Wikimedia

As a private airport operator Rio Tinto are under no obligation to meet International Civil Aviation Organisation (ICAO) regulations. However the company are committed to providing a sustainable duty of care to their employees and therefore provide an appropriate level of fire and crash-rescue cover to oversee aircraft movements at their airport operations. Currently the company is upgrading this level of cover with a project incorporating the refurbishment and re-purposing of some existing vehicles as well as the sourcing of a large ARFF vehicle and three stored pressure CAFS fast response vehicles. In 2014 the company started discussions with Perth based Frontline Fire Rescue Equipment to supply a new airport rescue and fire-fighting vehicle for its Boolgeeda Airport operation as well as the supply of the CAFS fast response vehicles and the refurbishment project.

Frontline Fire & Rescue Equipment established in 2007 are one of Australia's leading manufacturers of fire-fighting and specialist vehicles. From their new state of the art headquarters located in the Malaga district of Perth the company use the latest design technology and manufacturing processes to produce quality, innovative and practical fire appliances finished to the customers exact requirements. The company manufacture vehicles under contract for the Western Australia State Government and custom built vehicles for multi-national mining and oil/gas clients. They offer servicing and maintenance support for existing fire-fighting vehicle fleets and they are currently in the early stages of a 3 year multi-million dollar (A$) contract for the upgrade of 700 fire engines with enhanced crew protection measures including water deluge systems.

Frontline Fire & Rescue Equipment have recently delivered this stunning clean-flowing one-off custom built ARFF vehicle to Rio Tinto Iron Ore for its Boolgeeda Airport operation – the Australian built fire truck considered to be a serious rival to equivalent commercial based ARFF vehicles manufactured by leading international fire-engine manufacturers. Working closely with the customer the company have designed this stunning highly specified aerodrome fire-fighting and crash rescue vehicle from the ground up using the latest computer aided 3-D technology and the expertise of their technical, drafting and engineering teams. RTIO have acknowledged the importance of the local content of this project and the after sales, support and maintenance that can only be provided by a local supplier.

This airport crash tender is based on a special-build Scania P360CB 6x6 HHZ chassis fitted with a 265 kw Euro 5 diesel engine, 12 speed automated manual transmission, an engageable transfer case plus ABS braking. It features a Scania "Day" cab seating a driver and 1 crew with integrated SCBA seating and a modular aluminium body incorporating 4 large lockers enclosed by Centurion roller shutter doors. The rear pump module houses a Waterous CXVT pump delivering 3,800 lpm @ 10 bar which is powered by its own independent Cummins water-cooled diesel engine. The pump module also houses 2 x electric rewind hose reels complete with 60 metre x 25 mm booster hoses and Akron Pistol Grip nozzles; the comprehensive pump control panel, the on-board foam-fill system, various deliveries and the suction inlet.



Images courtesy of Matt Hayes

FRONTLINE FIRE & RESCUE EQUIPMENT

▲ A stunning image highlighting the clean lines of the innovative Scania P360 CB6x6 HHZ airport crash tender supplied to Boolgeeda Airport in Western Australia.



▶ The rear pump module; showing the Waterous CXVT pump, pump control panel, deliveries and suction inlet plus external tank warning lights.

The central tank module consists of a single alloy tank holding 8,000 litres of water, plus 1,000 litres of class "B" Solberg RF6 foam concentrate (linked to a FoamPro Auto-Foam foam proportioning system) and 200 litres of Solberg Fire-Brake concentrate (linked to a FoamPro Turbo-Foam foam proportioning system). The front module houses a skid mounted Perren Engineering 125 kg DCP system c/w hose reel and nozzle to the off-side – plus various stowed fire-fighting and crash-rescue apparatus. The tender makes use of an Akron Trident remote roof mounted monitor c/w manual in-cabin override combined with an Akron Electric foam nozzle delivering 3,000 lpm – plus an Akron Firefox remote bumper turret fitted with an Akron Electric Jet/Fog Master Stream nozzle – delivering 500 lpm. It also has under body foam sprays, a windscreen water spray system and is fitted with Hazard LED lighting to the front, sides, rear and roof of the fire truck.

This innovative crash tender was manufactured to a very high standard meeting all current ICAO and NFPA standards.

As the vehicle is to be operated by their existing Emergency Services staff, it was a requirement that the vehicle could be deployed and operated by only one person. Whilst its main purpose is to provide fire-cover to the aerodrome, the vehicle has been designed to complement the existing fleet of Mines Emergency Response Vehicles, at other incidents that may occur on the rural site.

For more information, go to www.ffre.com.au

Scott Safety

A game changer in decontamination is achieving a fire industry first

A new portable airborne and surface decontamination solution from Scott Safety is achieving a fire industry first – decontamination of chemical, biological and radiological vapours, liquids and particles simultaneously in as little as five minutes.

The Light Decontamination System – LDS can decontaminate environments as large as 500m³. At only 22 kg, LDS is the lightest portable decontamination system in its class, enabling first responders to work effectively in both confined and remote environments.

"LDS will revolutionise the fire market" says Dr David Crouch, Global Product Manager for Military & Civil Defence at Scott Safety. "It's lightweight, portable yet extremely powerful. In validation trials, the system decontaminated anthrax by 99.9999999 percent from a 100m³ space, in less than five minutes."

When exposed to CBRN (the release of chemical, biological, radiological or nuclear materials), prompt decontamination of fire fighters and their equipment following hazardous materials incidents, is paramount. Exposure can happen in a multitude of situations, from a call out to investigate accidental releases of hazardous materials at industrial locations, to flood defence, motorway fuel spillages and even terrorist activity. As the industry also learns more about the long-term effects of firefighter exposure to carcinogens and the link to occupational cancer, decontamination at the incident scene is more important than ever.

With the rising cost of Personal Protective Equipment (PPE), providing back-up gear for every firefighter in a brigade is a significant investment. LDS provides brigades with a cost-effective solution to fully decontaminate the vehicle, equipment and the firefighters themselves (with use of respiratory protection), enabling teams to return to the station in uncontaminated suits.

The LDS utilises new Scott Safety atomisation technology to create a fine mist to ensure even and consistent coverage and haptic dry surfaces. Rapidly projecting these droplets in the form of a dense and turbulent mist, the system is capable of delivering CBRN decontaminants to all non-line of sight surfaces. This process drastically reduces both the chemical footprint and time required for effective decontamination. Unlike many traditional decontamination systems which utilise liquids, this new process forces powders to behave like a gas, ensuring that sensitive and electronic equipment is not damaged.

Environmentally friendly and cost-efficient, LDS typically requires only five percent of decontaminant compared to traditional systems due to the gas-like behaviour of the small droplet mist. Easily directed and controlled with a lance hose, the system achieves a projection distance of up to 30 meters and is compatible with a range of chemistries.

The water payload of the LDS enables the system to be utilised for Class A and B Fire Fighting applications. For chemical and biological decontamination, the LDS is chemically agnostic so can use a diverse range of decontaminants including deliver of Alkoxides, Hydrogen Peroxide, Hypochlorous Acid, Peracetic Acid esters, Chlorine Dioxide, Sodium Hypochlorite and Potassium Peroxymonosulfate. Radiological and nuclear decontamination includes delivery of trippable coatings, fixatives and other sequestering liquids.

Following government plans to reduce the number of specialist decontamination units for fire and rescue services in England, LDS provides a highly mobile, scalable solution. For large scale infrastructure whereby longer duration or wider area capability of up to 2000m³ is required, Scott Safety also offers the Remote Decontamination System (RDS) which operates using a remotely operated 360° tripod to provide increased levels of decontamination efficacy and performance.

For more information, go to www.scottsafety.com/emea

▼ **The Light Decontamination System (LDS) from Scott Safety can decontaminate environments as large as 500m³.**



Image courtesy of Scott Safety



THE NEW PORTABLE AIRBORNE AND SURFACE DECONTAMINATION SOLUTION

The Light Decontamination System (LDS) represents a major advancement in CBRN decontamination. Offering lightweight and cost effective decontamination the LDS is a highly mobile and robust back pack designed for maximum operational flexibility. Designed to allow emergency personnel to work effectively in both confined and remote environments the LDS incorporates Scott Safety atomisation technology creating a superfine mist to ensure even and consistent coverage.

SCOTT SAFETY

For more information, visit **ScottSafety.com/EMEA**

Follow us on Twitter **@ScottSafetyEMEA**

HAIX Group

Proudly worn by firefighters in Germany and across the globe

Xaver Haimerl founded the HAIX company in 1948, establishing the first shoe factory in Mainburg, Germany. The company quickly made a name for itself locally by selling hiking and work boots.

The brand evolved in 1992 when Xaver's son, Ewald (a deputy fire chief at Mainburg's fire service and a master shoemaker at the HAIX factory) found that his fire fighting colleagues were unhappy with the rubber boots they had to wear. Ewald took action and designed a collection of functional leather fire fighting boots for his comrades, commenting "The more I learned, I decided to take the problem into my own hands."

This work quickly garnered praise and recognition, leading Ewald to design and develop footwear for rescue workers and the police. By 1999, HAIX produced more then 100,000 pairs of shoes per year.

The need for a high-tech production facility became apparent, leading to a custom built factory in Croatia in 2009, with much greater capacity levels. In 2011, HAIX celebrated its six millionth shoes leaving the production line. Annual production levels in 2015 reached 1,000,000.

HAIX has grown into an international brand renowned for its specialist approach combined with an unwavering stance on quality footwear. The brand is now also well established in the military, policing, emergency, forestry, and industrial sectors.

Changing Firefighter Role

One of the biggest changes the industry is experiencing is the ever evolving role of a firefighter and the transition to more rescue based work. Previous stereotypes that summarized a firefighters' role as simply putting out fires have been shattered and there is a growing awareness of how varied the job truly is.

HAIX designed, produced and manufactured the Fire Eagle after witnessing these changes, offering a footwear solution that accurately reflected the work completed by firefighters. This boot boasts a sleek, sporty functional design- lightweight and flexible whilst equipped with all required safety features.

With the Fire Eagle, HAIX designed footwear that also served as a visual signal function, with the two- colour design acting like a light in the dark when rescuers need to crawl one behind the other, entering confined spaces. This will mean they never lose track of colleagues in front of them and could make all the difference when worn in a real emergency situation.

As well as the Fire Eagle, HAIX offers a range of other footwear to the firefighting market to ensure the varied needs of firefighters globally are met. This range includes the Fireman Yellow- the preferred model for first time users, the Florian Europe – serving as the slip on boot for daily operations and Fire Flash, the most popular service boot with lace zipper closure.

Work is constantly ongoing to ensure these boots remain the best in the industry and models are adapted accordingly to changing demands. During the Fire Eagle launch, the boot was hailed as Fire Hero's 2 little brother. Similarly, cosmetic additions are expected to be unveiled on the Fire Flash later this year.

Ewald's first priority when designing footwear for firefighters in 1992 was to ensure that his comrades had the footwear they deserved and that it was an accurate reflection of their everyday roles and responsibilities. It is clear to see that this focus remains.

Toughest Boots In The World

Firefighters in Los Angeles, New York, Hamburg, Mexico City, Moscow, Hong Kong and Tokyo all place their trust in HAIX boots. Why? The footwear is industry leading – comfortable, reliable and equipped with all of the required safety features irrespective of terrain. Popular German TV show Galileo recognised this and once said that HAIX produced "the toughest boots in the world".

HAIX continues to set standards with innovative designs created by the unrivalled expertise of the brand's technicians. HAIX has a proud history of working with firefighters for firefighters.

For more information, go to www.haix.co.uk

▼ **Ewald Haimerl, CEO of HAIX.**



© Image courtesy of HAIX Group





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POK FIREFIGHTING EQUIPMENT

VIKING Guardian

DuPont™ Nomex® partner develops suit innovation to protect firefighters

DuPont™ Nomex® Partner VIKING Life-Saving Equipment has developed a ground-breaking suit concept incorporating DuPont™ Nomex®, with a detachable outer shell, to help reduce firefighters' exposure to potentially harmful particles, resulting from combustion from a fire. In addition, this concept allows for easy cleaning. Contamination poses both a risk to the firefighter's health and to the degradation and performance of protective garments.

Showcased as a winner of the DuPont™ Nomex® Garment Innovation Awards at Interschutz this year, VIKING Guardian is purpose-made to provide firefighters with an entirely new level of protection.

Incorporating DuPont™ Nomex®, the Hainsworth TITAN® outer shell can easily be removed by the firefighter after attending a fire, leaving the inner liner to be worn during debriefing and the return to base. Before getting into the fire engine, the outer shell is simply placed in a dissolvable washing bag. Contained in the bag, any residual particles on the garment surface are effectively cut off from close contact with firefighters and their physical environment during transport, washing, storage and other routine tasks.

The VIKING Guardian is inspired by the multi-piece VIKING suits worn predominantly outside Europe. However, where those suits are primarily designed to avoid cross contamination during washing and ease of repair, the VIKING Guardian's design objectives went much further.

Firefighter comfort received special attention, with features such as pre-bent knees and elbows, a removable hood, and superior, adjustable flexibility to handle many different work situations. The highly durable suit is reinforced with DuPont™ Kevlar® in arms, knees, in the pockets, and at the hem of the pants and the jacket. Attention to detail is evident throughout the design, making it easier, for example, to don communications equipment.

"Comfort is a key part of ensuring safety," says Keld Valentin, "An uncomfortable suit may not be worn properly or even avoided where possible, reducing the wearer's level of protection from heat and contamination."

General durability was also important. A strategy behind the multi-piece design was the ability to extend the lifetime value of components. Making it possible to purchase a new lining or outer shell separately rather than discarding the entire suit if only part of it is damaged or worn.

One of just four companies recognised by the DuPont™ Nomex® Garment Innovation Awards, VIKING Life-Saving Equipment is part of the DuPont™ Nomex® Partner Program developed as part of DuPont's commitment to protection quality. It is a carefully-selected network of customer-oriented and progressive weavers and garment manufacturers whose fabrics and garments pass DuPont's rigorous quality controls. Other winners of the awards include S-GARD, TEXPORT and Bristol Uniforms.





Images court tesy of VIKING

▲ A winner of the DuPont™ Nomex® Garment Innovation Awards 2015.

◀ A detachable outer shell helps reduce fighters' exposure to potentially harmful particles.

For more information, go to www.viking-life.com

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BAE Systems, Warton, UK

High-tech trainer keeps fire crews ready for action

For specialist firefighters at BAE Systems' busy runway, the ability to hone their skills using the most cutting-edge training technologies is key.

And the team of 25 firefighters at the Company's own in-house fire service, based at Warton, Lancashire, is making use of the latest innovations at their purpose-built training facility near the site's airstrip.

The site's newly revamped high-tech Fire Ground Training Simulator replaces a previously used facility, which was both smaller and based on a hybrid of a civil aircraft and a Harrier jet.

Providing a rare glimpse inside the new facility, built to replicate the Company's 146 airliner, station Watch Manager Kieran Merriman, said: "The simulator is allowing the team to undertake the latest training techniques and build the specialist skills needed to deal with any incident."

Crews from the service are on standby during daily flights at Warton as well as test flights of some of the world's most technologically advanced combat and training jets.

And while the Company's aircraft, including Typhoon and Hawk, have an impeccable safety record, Mr Merriman says the new facility now ensures firefighters can access the most realistic on-site training possible should a real incident ever occur.

He said: "The new fire training simulator has been designed to provide the most realistic training environment possible for our firefighters.

"Having a facility on site allows the fire fighters to train to a high standard. This training ensures they are competent and prepared to work within the hazardous environments that they may encounter.

"The old facility was loosely based on a hybrid between a small civil aircraft and a Harrier. However, it was very small and didn't accurately represent the type of aircraft that we encounter at Warton.

"The new facility has been constructed around the same fuselage dimensions as the 146 aircraft. Therefore we are providing our fire fighters with a training environment that is conducive to the largest type of aircraft that they are regularly likely to encounter."

The facility allows firefighters to take on outside and inside fire scenarios which may be encountered on a runway. Sensors inside the facility also allow trainers to monitor the exposure of firefighters to heat, ensuring the area is as realistic but safe as possible.

In the external areas firefighters can tackle fires on replica engine fire and undercarriages as well as fuel leaks, using live fire.

Meanwhile, the internal side of the facility simulates a structural collapse in an aircraft, allowing them to practice search and rescue techniques and use thermal imaging technology in the most realistic surroundings possible.

The use of live fire – using kerosene lit with a pilot light – means firefighters can train in the kinds of fire, smoke and heat conditions they would encounter in a real emergency.

Mr Merriman, who led on the facility's design, testing and installation, added: "Specialist training is required here in several significant areas. Specific to Warton, we train our firefighters around the military fast jets.

"The risks that ordinary firefighters face, broadly speaking, are known and well researched. A lot of what we do at Warton is cutting edge.

"The simulator here at Warton has been upgraded with the use of latest technology. This includes auto alarms that are connected to thermo-couples within the training simulator, which means that we can accurately monitor the exposure of our firefighters to the effects of heat, therefore providing a safe yet realistic and challenging environment.

"Additionally the four thermo-couples are linked into a computer that electronically records the internal temperatures. The use of Avtur (kerosene) as a fuel for burning is the most accurate and realistic available."

The training facilities are not the only impressive piece of equipment crews at Warton use. The site's fire service has a fleet of high-tech six-wheel drive Rosenbauer fire engines, which have off-road tyres designed to negotiate conditions at the end of the runway.

The 39 tonne vehicles can deliver 6,100 litres of water every minute. They can also carry 1,500 litres of foam and secondary media, including 225kg of dry powder.

Also recently completed is an off-road Argo Cat training area, ensuring firefighters can train on operation of their all-terrain Argo Cat vehicle and prepare their ability to handle the potentially difficult terrain which sits at either end of the Warton runway.

However, there are also many similarities between the crews at Warton and more 'traditional' fire services.

The team operates in four watches Monday to Friday and they are on duty at the same time from 7am until 8pm.

On Saturdays and Sundays they have one crew which is on duty from 7am to 8pm.

"We are a traditional service in that we will have a formal parade at 7am when everyone will have the crewing read out to them," added Mr Merriman. "The guys will take the vehicles out every day and check all the levels, the tyres, water levels, oil and so on.

"It is then down to me to declare the scale of resources we need to provide to conduct flying that day. We will the go into our training period from 8am until 9.30am every day. It could be theoretical, such as lectures on aircraft or radiation for example, and we also do practical training on our fire ground.

"We have also got an ambulance, which is operated on a rota basis. We carry out daily checks on that and we respond to medical incidents and fire alarms across the site.

"We have 25 firefighters here and everyone is trained in emergency care. It is not quite to the same level as a paramedic but we are trained to respond to 'red' (emergency) incidents.

"When we are not doing those things, we have a lot of responsibility for fire safety around the site. It is a varied role."

For more information, go to www.baesystems.com



▼ Firefighters tackle a blaze during a training exercise at their specialist training ground at BAE Systems' Warton site in Lancashire.

Image courtesy of Ray Troll, BAE Systems



Images courtesy of Ray Troll, BAE Systems



▲ A mock engine fire at BAE Systems' fire service's training facility, which is set up to replicate a BAE 146 airliner (top). Some of the specialist firefighters based at BAE Systems' site at Warton (above).

ROSENBAUER FIRE ENGINES AT BAE SYSTEMS, WARTON

- 6x6 wheel drive, allowing the vehicles to negotiate tough terrains.
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How the UK fire service is revolutionising situational awareness

The latest advances in thermal imaging and gas detection now enable firefighters to interpret a scene from safer distances, helping to eliminate the need for high risk 'fast attack' entry to burning buildings and keeping firefighters safer as they save lives.



Tony Pickett

Brought to the UK's fire services by Scott Safety, a leading innovator in equipment for firefighters and first responders, the technologies can be fixed, portable or even deployed via a robot to provide intelligence on the specific makeup of the fire and highest risk factors.

Developed to help build the 'bigger picture' of every incident and how to best tackle the blaze, new solutions have been developed to reduce user burden and incorporate real-time telemetry, situational intelligence and communications in hazardous environments.

▼ **The X380N allows firefighters to fully interpret a fire scene and make better, safer, more tactical decisions.**

Already a global leader in the design, manufacture and supply of respiratory protective equipment, recently Scott Safety acquired two companies whose design, technology and product creation capabilities complement and enhance those of Scott Safety: thermal imaging company ISG and gas detection specialist IST Group (GMI, Oldham, Simtronics and Detcon). In bringing these two world-class companies together, and with the launch of this new X-380 camera, Scott and ISG customers now have an exciting new range of thermal imagers from which to choose.

For firefighters entering the unpredictable environment of an inferno, the latest X-380 thermal imaging camera powered by ISG Technology, now utilises



Image courtesy of Scott Safety

Tony Pickett is Global Product Manager at Scott Safety.



Image courtesy of Scott Safety

▲ **Acting as the 'eyes' of the brigade, the portable ROV1 robot can be deployed to get closer to a burning building than is physically safe for firefighters.**

both hot and cold spot tracking to enable firefighters to navigate in the safest areas. Using this technology, firefighters can instantly see and create paths through cooler spots and avoid the highest risk areas such as floors or ceilings likely to collapse in the blaze.

The cold spot tracker enables first responders to locate and pin point thread or valve gas leaks as gas in general will be colder in temperature than the environment surrounding it.

The X-Series X380N camera which is NFPA 1801 compliant, provides the perfect combination of technology, lightweight design, and robust features to enhance situational awareness. In addition to achieving NFPA compliance, the X380N offers high resolution detection, superior image quality, Intelligent Focus™ to clearly see at temperatures above 1000C°and transparent colourisation.

The X380N allows firefighters to fully interpret a fire scene and make better, safer, more tactical decisions.

The National Fire Protection Association (NFPA) 1801 standard provides rigorous environmental and durability testing such as impact, flame and heat similar to SCBA durability tests. The standard also defines performance requirements around image quality and fixed location of onscreen symbology to enable training and facilitate mutual aid situations.

ISG has more than 20 years of thermal industry firsts and has always manufactured cameras to its own tough standards. Many of its original models like the Talisman and K-Series are still in operational use around the world today. The X380N camera is available through Scott Safety's network of global distribution partners

Manufactured in both the UK and US, ISG advanced thermal imaging cameras have fast become the camera of choice, winning all major UK tenders this year. In 2014, the company has gone from strength to strength, taking extensive market share from its competitors and traditional UK incumbents. For example, 54 X-Series cameras are now in operational use at Suffolk FRS and over 30 X-Series cameras are in use at Staffordshire. Both brigades, plus many others, have made the recent move to ISG to improve firefighter pre-emptive ability and safety.

UK brigades are calling the X-Series a tactical camera. Scott Safety has had great feedback from many of its UK customers who tell them firefighters are getting a much clearer understanding of a fire scene using the X-Series, compared to traditional thermal cameras. The X-Series enables firefighters to make better tactical decisions because it has a unique ability to provide clear and precise image data during firefighting.

Advancing the capabilities of these technologies, robotic technology is now working to reduce the exposure of human firefighters to fires.









Images courtesy of Scott Safety

▲ Scott Safety introduces CODFM; the first ever telemetry system to attach to a thermal imaging camera.

Imagine this scenario: A building containing potentially explosive cylinders is engulfed in flames, the sound of fire sirens drown out voices, and firefighters are putting their lives on the line close to the blaze.

But what if, hours before, the Incident Commander had deployed a small robot with a built-in thermal imaging camera and gas detector to gain a close-up view of the building? And what if those images were logged into a database and accessed by firefighters planning to tackle the fire?

This technological innovation is now being put to the test by British firefighters who are working with Scott Safety to integrate the latest thermal imaging and gas detection technology with the unit's ingenious ROV1 robot.

Acting as the 'eyes' of the brigade, the portable ROV1 robot can be deployed to get closer to a burning building than is physically safe for firefighters and provide imagery and data that would otherwise be unattainable. Using thermal imaging, firefighters can pinpoint the centre of the fire and essentially 'see' through the smoke to plan their extinguish plan.

Also used by the police force as a counter terror device, the robot will soon incorporate gas detection technology. This is essential in situations where gas canisters are present to both evaluate the risk of explosion and to measure potentially harmful chemical combinations 'boiled up' in a fire. Going one step further, the ROV1 now uses the latest Cobra Cold Cutting Extinguisher which can break through a wall to extinguish or calm the fire, making it significantly safer for firefighters to enter.

The future

Looking to the future, it is expected that more firefighting equipment will become wireless compatible and join 'the internet of things' where devices are linked together through the cloud. Items including gas detectors and thermal imaging cameras could then talk to each other. For example, location and gas detection data could be overlaid to enable the mapping of gas concentrations across an area in real-time, providing insight into the developing situation inside.

In the case of robotics like the ROV1, future wireless capabilities could enable firefighters to access buildings from even further away. Currently operated via an optical cable with a reach of up to 100m, the ROV1 is limited in the distance it can be deployed. In the case of cylinder fires or high risk explosive environments, wireless technologies could help mitigate the risk to firefighters and the public's lives even further.

In September Scott Safety introduced CODFM; the first ever telemetry system to attach to a thermal imaging camera. Previously, this technology has only been used on perimeter cameras outside of a fire scene. For the first time, firefighters will be able to view images of the inside of a burning building, providing an even deeper insight into the individual risks presented. This advancement in technology will enable fire officers to more accurately predict hazards such as flashovers and brief their team accordingly. Greater situational awareness is the future of firefighting and will help to ensure that every fire fighter comes home after the job is done.

Scott Safety is breaking new ground as recent acquisitions have enabled the company to discover connections between seemingly unrelated technologies or concepts to create brand new solutions.

This innovative approach opens up a world of new thinking. Could we be looking one day at headgear for example, that integrates a plethora of traditionally handheld technologies such as thermal imaging or gas detection, freeing up safety professionals get on with their jobs more efficiently?

For more information, go to www.scottsafety.com/emea

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Firefighter PPE procurement – the essentials

As high performance technical garments, firefighter protective clothing is required to deliver levels of protection and wearer safety which not only need to satisfy national and international performance standards but also trust in its integrity by those whose health, safety, and ultimately whose lives, depend on it.



Richard Cranham

Richard Cranham is International Sales Manager for Bristol Uniforms.

Much has changed in the way today's firefighter PPE is designed and made as compared with as little as 15 years ago, and it is these product and performance developments which need to be understood by users when specifying garments for firefighters to ensure that the benefits, which the latest technology in fabrics and manufacturing methods are able to provide, are fully realised in the procurement process.

There are a number of elements which contribute to the overall capability of a supplier to deliver to the world class standards widely accepted as essential to ensuring safe working for firefighters whether involved in structural, wildland or technical rescue operations. The purpose of this article is to look at each of these to demonstrate their respective contributions to overall service delivery.

As a manufacturer, the process begins with having a team of skilled professionals with a combination of technical and design expertise and experience. Within this skill set will be an in-depth understanding of materials, their characteristics and behaviour during both the manufacturing process itself as well as the testing procedures carried out on completed garments where two, or more, layers are involved in the construction. It is the skill of the designer to be able to translate a customer's requirements into a product specification which meets both these as well as the



◀ Bristol LayerFlex™ in 3DP outercoat with high vis yellow RescueFlex™ undergarment.

Image courtesy of Bristol Uniforms



Image courtesy of Bristol Uniforms

▲ **Bristol XFlex™ in PBI Matrix.**

performance required by national or international standards.

Given the primary purpose of firefighter garments to protect the wearer from external risks associated with exposure to heat, flame lick, flashovers, water ingress and, where appropriate, blood borne pathogens, it is essential to design garments in a way which will minimise skin and body exposure through the optimal reduction in transmission through the garment. Coupled with this is the need to alleviate the known health risks from the physiological responses of the human body to being enclosed within the garment and its ability to allow heat and moisture vapour to escape to minimise operational heat stress and discomfort from sweating. Designing garments to address the complex combination of risks emanating from outside and inside the garment is key to creating high performance PPE.

Firefighter garments are bespoke items of clothing with every coat and trouser being made to measure. Optimal protective performance can only be assured through using a comprehensive sizing procedure which ensures the individual wearer has well-fitting garments. In addition, the operational requirements of individual fire and rescue services will be reflected in the detailed specifications drawn up by their procurement team. The wide variety of options available to meet these particular preferences include alternative types of trouser front and leg openings and knee pads as well as cuff styles on fire coats. Other options include detachable linings and knee and elbow reinforcements. Operational safety features such as integrated safety harnesses and drag rescue devices are sometimes specified. Breathable reflective tape is used to improve the overall moisture transmission out of the garment whilst Trimsaver is a thread encapsulating technique used to protect the thread from abrasion and reduce garment wear and repair. Firefighter accessories including tools, lighting and communications equipment all have to be carried safely requiring the provision of a wide range of loops, straps, D-rings, glove hooks as well as pockets and flaps which add further to the large number of permutations which form part of the bespoke nature of PPE design.

A further consideration is the need for fire services to present a professional and clearly recognisable identity to their communities. Colours and badging feature increasingly in procurement specifications. This has led to the introduction of a range of new fabric colours and the increased use of Velcro fixings for identification badges with logos, names and roles being individually catered for and easily replaced when an individual's PPE needs to have a name, rank or job title changed. Whilst blue and gold have been the traditional dominant colours for PPE, reds, yellows and greens are becoming more popular and frequently used in combination for emergency services protective garments.

The characteristics of the natural and synthetic fibres used in the manufacture of specialist PPE fabrics all play a key role in determining the finished garment's protective features. World class performing outer fabrics display different characteristics when exposed to heat and flame and will be selected during the procurement process depending on a user's preferences. DuPont Nomex® and PBI Performance Products offer fabric weavers fibre alternatives which become part of the range of outer layers available as Nomex®, PBI and Hainsworth TITAN fabrics whilst other fibre producers and weavers offer a further range of options. W L Gore are the principal suppliers of the most commonly specified moisture barriers which come in a variety of fabrics in their GORE-TEX® and CROSSTECH® ranges. Thermal barriers used as the inner lining of structural fire kit are either quilted Nomex® barriers or Hainsworth ECO-DRY linings.

Firefighter PPE is offered in a wide range of styles. Each manufacturer designs garments in a range of models which they consider most appropriate for their served markets. Available options should recognise the need to offer specifications to meet the budgets available to fire and rescue services in different countries. In some parts of the world, single performance standards prevail whilst in others, for example in Europe, structural firefighter kit can be offered at two levels – EN469:2005 Level 1 and 2. Additionally, the broadening scope of firefighter activities, including technical rescue and wildland firefighting, has seen the introduction of more specialised garments specifically designed for different operational environments. Given the current level of choice in firefighter garments meeting the relevant standards requirements, the procurement process should seek to exploit the innovative capabilities of alternative suppliers. In so doing, manufacturers will be encouraged to focus attention on new product development leading to a wider choice of cutting edge garments to the customer's benefit.

Personal protection in hazardous occupations, amongst which the emergency services rank as having exposure to some of the greatest risks







▶ Bristol RescueFlex™.

Image courtesy of Bristol Uniforms

outside of the military, clearly demands that garments are rigorously tested by independent test facilities. This will ensure that they fully meet the performance standards firefighters expect, and rely upon, to protect their health and safety whatever front line conditions they encounter. Special test rigs have been designed to carefully measure the performance of garments. These include strength and permeability tests for fabrics and composite constructions such as those provided by the British Technology Testing Group (BTTG) in the UK. Fire tests are carried out using special manikins which simulate a variety of fire ground scenarios and measure heat and flame penetration. The DuPont™ Thermo-Man® fire test rig in Switzerland is one example whilst BTTG use two heat sensing manikins, RALPH and SOPHIE, male and female garment rigs which comply with the manikin test standard ISO 13506.

Reference was made earlier to the importance of standards in connection with the various types of garments manufactured to protect firefighters across all areas of activity. The standards which cover the main regions of the world are European (EN) and North American (NFPA). Other areas which have their own versions of one of these standards include Australia and New Zealand. Standards are developed by working groups comprised of experienced and technically qualified representatives drawn from all parts of the industry including fibre manufacturers, fabric weavers, PPE manufacturers, independent test houses and fire and rescue services. Bristol, through contributing the expertise of its technical teams, has been involved in this work from the time of the original UK standards in the 1980s and in European standards since the inception of EN standards in 1995.

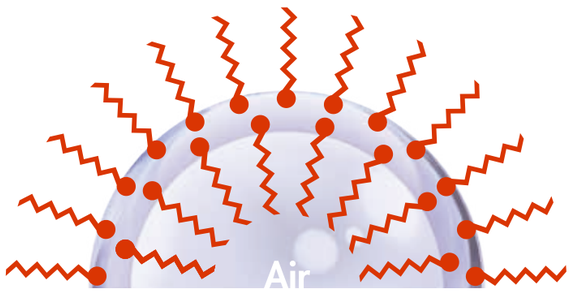
Bristol, as a global supplier, has developed a range of styles to suit operational environments ranging from cool temperate to tropical regions of the world. Utilising the scope provided by the range of alternative fabrics now available on world markets for the manufacture of firefighter protective garments, new concepts, such as Bristol's XFlex™, have emerged in recent years to meet these needs more directly. Clearly, given the 3-layer construction of structural garments, the issue of minimising wearer heat stress is more critical in warm temperate, sub-tropical and arid climates as well as tropical and equatorial climates. Bristol's LayerFlex™ is one solution. Using a layered approach, the lower levels of protection needed for technical rescue and wildland firefighting are provided for through the use of an under coat which is boosted to structural EN469:2005 Level 2 by the addition of an over garment. In this way, and by incorporating the latest lightweight fabrics, body heat build-up can be minimised.

It is clear that, in order to optimise the improved comfort and performance offered by the latest designs in firefighter PPE, suppliers and procurement teams should work increasingly closely to ensure that specifications, particularly in tender documents, provide scope for suppliers to discuss the various options available. Innovation brings with it opportunities to improve overall performance and deliver cost savings. Extending the service life of PPE through the use of managed services can bring further economies at a time when public sector budgets in many countries around the world are under close scrutiny.

For more information, go to www.bristoluniforms.com



Fatal Attraction



Fluorine-free foam bubble

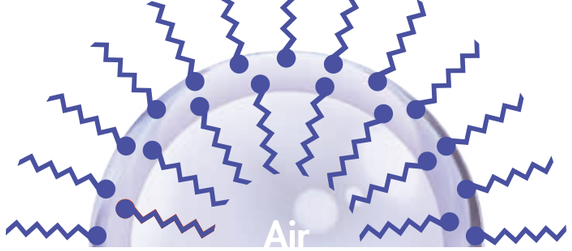
F3 Foam **attracts** hydrocarbon fuels

Hydrocarbon surfactant
(Hydrocarbon tails are fuel-loving)

FORCEFUL F3 APPLICATION:

- Foam attracts fuel
- Foam becomes flammable
- Foam has reduced performance
- Foam use is increased

Need proof? See F3 foams on fire:



Fluorinated foam bubble

AFFF Foam **repels** hydrocarbon fuels

Fluorosurfactant
(Fluorocarbon tails are fuel-hating)

FORCEFUL AFFF APPLICATION:

- Foam repels fuel
- Foam is NOT flammable
- Foam has superior performance
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Liquid Natural Gas (LNG) training for first responders: Part 1

Marine Firefighting Inc. has been training Mariners and Firefighters about Liquid Natural Gas (LNG) safety and firefighting tactics for over 14-years. This training had previously been conducted for the few large LNG import terminals in the US. Eventually, the US located massive amounts of natural gas within our own borders. So much so, that we will now be exporting this super cold product instead of importing. Facilities are being converted to now export LNG and many more new facilities are under construction or consideration.



Tom Guldner

Tom is a retired Lieutenant of the New York City Fire Department's Marine Division and is a Principal Member of the NFPA Technical Committee on Merchant Vessels. His company Marine Firefighting Inc. is involved in consulting and training mariners and land based firefighters in all aspects of marine fire fighting.

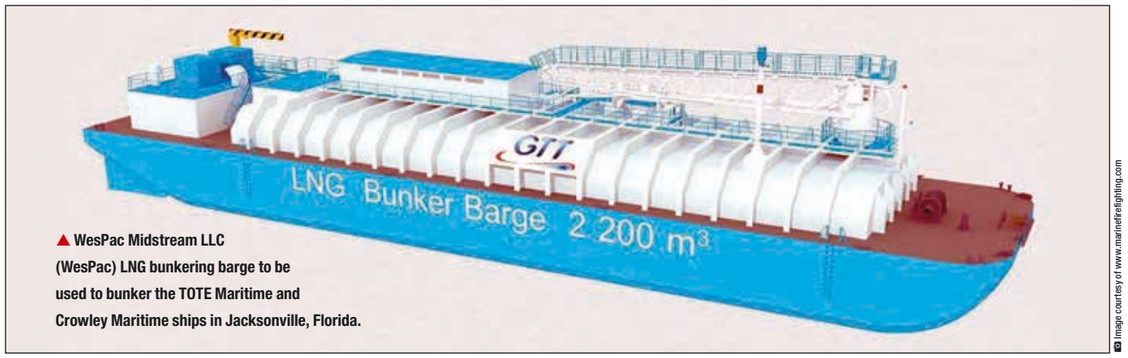
These large import/export facilities have been the subject of several of my previous articles. Many innovative fire detection, prevention, and suppression systems have been incorporated in these facilities. Firefighters and other first responders needed extra specialized training to deal with the hazards found at these facilities. For the remainder of the first responders who were not located near these facilities there has been little or no need for LNG training. But that is changing.

Another result of the new deposits of natural gas, both in the US and also around the world, is that because the supply is now greater than the demand, the price of this clean burning fuel has dropped to half its former price. Due to this cheaper LNG it is therefore now a viable and cost effective alternative to standard heavy fuels. Because of the price reduction LNG is now not only being used to power our ships and smaller vessels, but also our buses, trucks, locomotives, and even construction equipment. Consequently, many first responders who did not have to worry about dealing with LNG fires and emergencies will now have to learn and equip themselves to deal with this issue.



▼ Tom Guldner, President of Marine Firefighting Inc. instructs a classroom of Jacksonville, Florida First Responders in the properties of LNG and safety during emergency responses.

Image courtesy of www.marinefirefighting.com



▲ WesPac Midstream LLC (WesPac) LNG bunkering barge to be used to bunker the TOTE Maritime and Crowley Maritime ships in Jacksonville, Florida.

© Image courtesy of www.marinefirefighting.com

Many Fire Departments may not even be aware of LNG re-fueling stations in their response area or that LNG may be traveling through their districts on railroad tank cars and tractor trailers. Even vehicle fires may now have an LNG hazard because many of the vehicles will be powered with LNG. But, for now, lets get back to the ships and boats.

The marine industry has another reason, other than cost, for looking to LNG as a vessel fuel. Very strict environmental regulations have been, and are continuing to be placed on vessel emissions. The marine industry does not have too many alternatives to the heavy fuel oils and diesel fuels it has been using in the past. It can attempt to clean up the emissions by treating the flue gasses being emitted from their vessels which are using the current fuels but this is very costly and it may not meet the expected, more restrictive, future regulations.

Several forward thinking companies have realized that LNG is the only viable alternative and they have been building ships, ferries, and service vessels that will be fueled by LNG. It was a brave step because for many years there has been a, "chicken or the egg" equation which has stymied the advancement of LNG as a fuel. The shipper said, "If I build LNG fueled ships and there is nowhere to fuel it up I will not be able to use my ships". The LNG industry said," If I build the bunkering (re-fueling) facilities and no one builds the LNG fueled ships my facility will be idle."

Well, after several years of that argument preventing any movement in the LNG as a fuel dilemma several companies have come together to "bite the bullet" and forge ahead.

Totem Ocean Trailer Express (TOTE's) Sea Star Line has built two LNG fueled ships which will operate from Jacksonville, Florida to Puerto Rico. To re-fuel these vessels in Jacksonville, JaxLNG, (a partnership of WesPac Midstream LLC and Pivotal LNG) has started the process of setting up LNG bunkering in their port.

The re-fueling will eventually be done at a dedicated LNG bunkering facility to be constructed in Jacksonville. Until that facility is completed the first re-fueling operations will be done from an LNG tanker truck and later from an LNG bunkering barge which will be brought in until the permanent facility is completed. The first ship bunkering is scheduled for October/November 2015.

Another shipping company, Crowley is constructing two of their own ships to also operate out of the Port of Jacksonville and run to Puerto Rico. These combination container and Roll-On/Roll-Off (ConRo) ships will be in service sometime in 2017.

TOTE's is also converting two older ships to run on LNG. These vessels will work on the other side of the US out of the Port of Tacoma, Washington. Marine Firefighting Inc. just took part in consulting on the Port risk assessment for the Tacoma Fire Department.

Tacoma will have an LNG bunkering facility and TOTE's LNG powered vessels will run from Tacoma to Anchorage, Alaska. Until that facility is completed the TOTE ships will be re-fueled by a bunkering barge (photo left by WesPac) which is being built by California's WesPac Midstream and an affiliate Clean Marine Energy, based in The Netherlands. It will be a 2,200-cubic meter (about 580,000 gallons) LNG barge that will be deployed in early 2016 in Tacoma, where it will serve the 2-TOTE-owned vessels. The bunker barge will eventually be moved to the Port of Jacksonville, Florida, where it will also serve the two new TOTE vessels mentioned before.

All of the companies involved in this Jacksonville project wanted to insure that LNG bunkering would be carried out in the safest manner possible. To this end my company, Marine Firefighting Inc. joined with Gas Technology Institute to deliver an LNG Awareness and LNG Bunkering Safety program to the First responders in Jacksonville.

The program was developed specifically for Port of Jacksonville area stakeholders, especially local first responders, and included firefighters from the Jacksonville Fire Rescue Departments, the U.S. Coast Guard Sector Jacksonville, and local area law enforcement agencies. This training was the first step in the future LNG specific training for both mariners and First Responders dealing with the LNG bunkering and storage facilities planned for Jacksonville.

Many areas in the US, Canada, Europe, and in almost every country are using LNG now or are in the process of starting up some form of LNG operation. Very often first responders are either not considered in the training or may have to set up their own training programs. For LNG emergencies to be handled safely all stakeholders should be trained and drilled in a coordinated manner.

This program was an awareness level class dealing with the properties of LNG. The first responders received detailed descriptions of the characteristics of LNG which not only make it a great choice for the marine industry but which will also require specific knowledge, training, tools, and tactical changes to normal firefighting operations. In fact, all first responders will need to make some procedural changes.

In part 2 of this article we will discuss exactly what changes the Jacksonville, Florida first responders were instructed to make.

For more information, go to www.marinefirefighting.com

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The value of proportionate advice in chemical incident response

With the chemical industry expanding into new regions across the world, chemical supply chains are now wider than ever. When responding to chemical incidents, fire services must be prepared to encounter a growing number of potentially hazardous substances, each with their own bespoke handling procedures. However, while the chemical industry is growing many fire services are finding their budgets shrinking, requiring crews to reduce the time and cost of deployment for each incident.



Maria Stearn

Maria is product manager at the UK's National Chemical Emergency Centre (NCEC). She is responsible for developing Chemdata, NCEC's global database that provides emergency responders instantaneous advice to safely respond to chemical incidents.

Supporting global supply chains

Fire services play a dual role in the global chemical supply chain. With one hand they fulfil their primary duty of protecting members of the public from the risks of hazardous chemicals transport and use. With the other, they provide security to the markets that connect manufactures, distributors and end users across the world. Today, the value of emergency response is recognised as a core component for stability and growth in chemical export, not only for developed nations but in emerging regions around the world.

However, the immediate impact of this globalisation is that potentially hazardous products are emerging onto the market at a faster rate than ever before. When attending a chemical incident, emergency response crews must be prepared to encounter a vast number of substances with a range of different chemical names, brands and formulas, each with diverse hazards and handling procedures. Chemical hazard databases that provide up-to-date information on every substance likely to be encountered in the field are therefore key components in fire services' incident response arsenal.

Emergency responders must also balance this commitment to rigorous response with the need to reduce the time of deployment. This is increasingly important, not only to free capacity for emergencies but to reduce the cost of deployment, particularly where fire services operate within fixed or diminishing budgets. Adapting chemical databases to deliver more practical and proportionate advice has been identified as an effective way to help crews reduce the time and cost of chemical incident response while maintaining the safest procedures possible.

▼ Fire services are prepared to tackle major chemical incidents, even though they are statistically much more likely to be called out for spills less than 1 litre in volume.



© Image courtesy of the National Chemical Emergency Centre (NCEC)



◀ By basing chemical hazard advice on spill volume, Chemdata allows fire services to provide safe, proportionate and effective incident response.

▶ Chemdata is available in five different languages – Arabic, Dutch, French, German and Spanish – and on iOS and Android operating systems to provide advice directly in-the-field.



The value of proportionate advice

The hazards posed by a chemical substance vary significantly depending on the volume and nature of the spill. By considering hazards not only in terms of chemical properties but also in relation to spill volume, fire services are able to select precise response procedures and avoid unnecessary deployment of personnel or equipment.

For example, the UK's National Chemical Emergency Centre (NCEC) classifies nitric acid, a substance widely used in many processes including fertiliser, dye and pharmaceutical production, as a highly corrosive material which reacts strongly with metals to produce toxic nitrogen dioxide fumes. In responding to a nitric acid spill, NCEC recommends a range of personal safety precautions and handling procedures. These include standing up-wind of the incident to avoid toxic inhalation and never pouring water into concentrated nitric acid, as the resulting vapour pressure will create a serious explosion hazard. It also recommends the personal protective equipment (PPE) necessary for handling an incident: liquid tight suits for spills of less than 25 litres and gas tight protective clothing for anything larger.

Large spills of nitric acid therefore pose immediate risk to members of the public, the environment and emergency responders. However, while fire services must be prepared for a major incident they are statistically more likely to be called out for smaller spills. In many cases, this significantly changes the level of response required. When responding to a spill of nitric acid less than 1 litre in volume, NCEC recommends using a fire kit, breathing apparatus and protective gloves and boots rather than a chemical protective suit. The advantage of this is clear; the level of PPE preparation is less time intensive for a very small spill and less restrictive on the movement of the responder. Such proportionate advice therefore improves response times at each stage of the incident handling lifecycle, particularly during decontamination. Knowing when to thoroughly decontaminate equipment and collect run off water or simply wipe down a dry suit translates to a significant saving in time, freeing resources for more valuable deployment.

Scheduled for early 2016 release, NCEC's updated Chemdata chemical database will help fire services to cut the time and cost of attending chemical incidents by expanding its advice to include spills less than 1 litre in volume. Designed for use in moments of emergency, Chemdata is a global, multilingual service that provides instant access to detailed information on over 58,500 chemical substance and 171,000 product names. Available on desktop, iOS and Android operating systems, the tool provides practical and proportionate advice to help fire services make split second decisions in hazardous chemical environments, whether implementing snatch rescue operations or responding to minor or major spills.

Chemdata is developed with the direct input of fire service and emergency responders from around the world. For over 30 years the system has provided industry leading information on the chemical hazards and reactivity, necessary PPE, precautionary actions, environmental priorities and essential first aid required to handle chemical substances. Chemdata also provides general advice on contemporary topics in incident response. This includes advice on emerging trends in the chemical industry, including fuel cell and clean transport technology, and guidance on handling incidents of chemical misuse, such as explosives or narcotics manufacture.

The changing face of industry

As the chemical industry expands, governments, emergency services and private sector organisations across the world are coming together to improve safety provisions for chemical supply chains. Access to proportionate chemical advice plays an important role in helping fire services accommodate this expansion while preserving efficiency, whether responding to spills the size of a lorry load or those no larger than a pin drop.

This advice must only be provided by a credible and trusted source, as mishandling even a pin drop of some chemical substances can have tragic consequences. For more than 40 years, NCEC has worked with emergency responders and industry experts to provide comprehensive information on industrial and household chemical emergency response. By expanding the Chemdata solution to offer a greater degree of proportionate response, fire services are now able to optimise each step of the incident lifecycle, without a trade-off in rigour or security.

For more information, go to www.the-ncec.com

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TYRE MANAGEMENT

Where the rubber meets the road: the importance of tyre husbandry

A tyre failure is an inconvenience for a commuter looking to get to work on time. For firefighters, such an event can be the difference between life and death. What steps should services take to keep firefighters safe on the road?



Dan Lamb

Firefighting is a tough job; so it goes without saying that anything associated with the profession needs to be equally tough: protective equipment, helmets, ladders, hoses – you name it. The same is true of the fire appliances the public rely on in their time of need – and of the tyres those vehicles roll on.

For fire services around the world, there's no more important piece of equipment than their fire appliances. These trucks are put under stresses that other heavy vehicles employed by road haulage firms will simply never face. Under blue light conditions, fire appliances need to corner harder, retain traction in the worst weather, accelerate at a moment's notice and transport a heavy load of crew, water and equipment faultlessly, efficiently and safely.

▼ **Michelin is leading the way in recommending a switch to the larger 315/70 tyre size.**



Image courtesy of Michelin

In order to meet these requirements, Michelin has developed technologies and working practices that are suited to the uniquely challenging nature of a firefighter's work – and it all starts with weight.

Economies of scales

Unlike road transport firms, which have to consider the correct tyre pressures for vehicles running both fully-laden and empty, fire appliances have one advantage when it comes to establishing tyre pressures – they're almost always running at about the same weight.

While this makes finding and maintaining optimum tyre pressures easier for fire services in the long term, it also throws up a unique set of challenges.

To illustrate: whenever a new vehicle type joins a fire and rescue fleet that Michelin works with, the company's technical team puts the vehicle on the scales – complete with its normal crew complement, fuel, water, foam and equipment.

By subsequently weighing each wheel position individually to establish the vehicle's axle loads, pressure suggestions are developed to provide optimal handling, stability and grip, whether the vehicle is moving at speed or heading home sedately following a call-out.

This weighing process also allows services to get the best from their tyres in terms of mileage performance and longevity, via tyre pressure management – although, naturally, this isn't the key focus for most services, despite the ever-present pressure to reduce costs.

In fact, when it comes to tyre pressure management for fire and rescue services, the difficulty lies not in total weight, but weight distribution.

Fire services frequently aim to standardise the positioning of vital, life-saving equipment across vehicle types. With time always of the essence in an emergency, finding that vital bit of kit in an unfamiliar vehicle could be key. However, such a practice can also leave individual vehicle axles overloaded or underutilised, putting too much load (or too little) on their accompanying tyres.

Fire services should work with their tyre provider and vehicle manufacturer to examine weight distribution from an early stage. This would allow services to "spread the load" where possible, to ensure longevity, traction and handling in all conditions, without degradation of service or safety.

This issue of weight distribution is often more acute for services operating smaller vehicles, such as those rural services that are regularly faced with country lanes, mud-splattered corners and miles of track without a lamp post in sight. These vehicles still have to carry large amounts of equipment, and therefore tend to operate closer to their maximum gross vehicle weight. This then means that they have less spare capacity on the individual axles.

However, away from the vital need to find and maintain the correct tyre pressures and weight distribution on vehicle types across a fleet, consideration should also be made for selecting the appropriate tyre sizes, tread patterns and fitment policies.

Tread new ground

For many UK fire services, the move to 315/70 R 22.5 tyres (315 being the nominal section width of the tyre in millimetres, 70 the height of the tyre sidewall as a percentage of the nominal section width and 22.5 the nominal diameter of the wheel rim in inches) for larger appliances has been slow, but is gaining pace.

Michelin is leading the way in recommending a switch to the larger tyre size, as 315/70 tyres feature a wider nominal section width than the smaller 275/70 R 22.5 tyres previously favoured by services, providing a wider contact patch, and therefore a greater contact area with the road surface. This promotes even wear, with a high degree of tyre stability for improved vehicle handling – vital for blue light work.

These larger tyres also help with the weight distribution issue. The tyres offer up to 8 tonnes of load-carrying capacity on the front axle, a significant increase over the 6,300kg carrying capacity of the 275/70. This means that even with the increase in front axle loads due to the engines' Euro VI emissions equipment,

New tyre strategy for Scottish Fire and Rescue Service

The Scottish Fire and Rescue Service is benefiting from improved tyre life, durability and traction for its frontline appliances after adopting the latest generation truck tyres.

The service became the first emergency service in the UK to fit a set of 315/70 R 22.5 Michelin X MultiWay 3D XZE all-position (steer) tyres in 2011. Five years on, the fitments are still fitted after more than 58,000 km in service and are projected to achieve in excess of 71,000 km – an approximate 94 per cent increase in mileage performance over the previous fitment.

Fleet Manager Scott Roberts pioneered the shift from 275/70 R 22.5 XZE2+ tyres – previously the favoured tyre size for an 18 tonne fire appliance – and says that the move to larger tyres, combined with the new Michelin tread pattern, ticks all of the boxes.

Critically, the all-position X MultiWay 3D XZE tyres feature M+S and 3PMSF markings, highlighting their ability to deliver traction on snow and in mud.

Previously, even urban-based appliances on all-position tyres could struggle for traction in challenging conditions. However, the new tyres' credentials enable the Scottish Fire and Rescue Service to specify all-position tyres as an all-round fitment on new heavy appliances – even those for rural areas, which previously required drive pattern tyres to ensure sufficient traction when road conditions deteriorate.

As well as fitting the latest generation tyres on its 18 tonners, the Scottish Fire and Rescue Service is also fitting Michelin's new X Multi range of tyres on its smaller 15 tonne trucks. 285/70 R 19.5 X Multi Z tyres have been specified as original equipment on 15 new Volvo appliances.

The new X Multi Z tyres stand out for being safer, more fuel-efficient, quieter and longer-lasting than the previous generation Michelin XZE2s they replace.

▶ **The service was the UK's first to fit a set of 315/70 R 22.5 Michelin X MultiWay 3D XZE all-position tyres in 2011.**



Image courtesy of Michelin

Dan Lamb is a Technical Manager at Michelin covering the north of England and Scotland, alongside fire and rescue and government contracts. Previously an Account Manager working with truck fleets, Lamb is a regular visitor to fire services and road transport firms, using his 22 years of experience within Michelin to ensure customers get the best from their tyres.

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© Image courtesy of Michelin

▲ X MultiWay 3D XZE tyres feature M+S and 3PMSF markings, highlighting their ability to deliver traction on snow and in mud.

the 315/70 can cope with the weight transfer from hard cornering and heavy braking common when the sirens are sounding. Previously, when using the smaller tyre, these appliances could suffer from excessive understeer when the front axle loads were at the limit.

The Michelin approach to this tyre selection conundrum is a focus on ensuring the optimum tyre pressure is established and maintained for all axles, using a dedicated calculation specially derived for emergency response vehicles by the Michelin Technical Team. This ensures optimum traction, handling and stability. This, where possible, is accompanied by dynamic handling assessments, to fine-tune the vehicle handling characteristics.

However, selecting the correct tyre for the job doesn't stop at tyre size – there's also the tread pattern to consider.

Fit the pattern

Historically, UK fire services fitted identical tread patterns to both axles, as this offers the best handling balance. Then – following some particularly challenging winters – some services, particularly in the north of England and Scotland, instead opted to fit drive-pattern tyres to the drive axle, and steer-pattern tyres to the front. While this compromise had a marginally negative impact on vehicle handling balance, it provided improved traction on snow-covered roads, ensuring appliances made it to the call safely, quickly and reliably.

Today, tyre technology has advanced to a point where fitting the same tread pattern to both axles can again be considered, even for challenging conditions.

To illustrate, Michelin's latest-generation regional X MultiWay 3D XZE all-position (steer) tyres carry both the Mud + Snow (M+S) and Three Peak Mountain Snowflake (3PMSF) markings.

Traditionally an M+S tyres' tread design generally had lateral grooves in addition to the circumferential grooves found on 'standard' steer tyres, and are specially designed to improve performance in mud and fresh or melting snow. The 3PMSF symbol, meanwhile, is only applied to tyres which meet the requirements specified within ECE regulation 117 for traction and braking in defined snow conditions – all of which adds up to a better vehicle handling balance when fitting multi-position tyres on each axle, and with minimal impact on traction in bad weather.

As a bonus, fitting only one type of tyre means storing only one type of spare, ultimately cutting costs and streamlining the supply chain.

Top tips

To conclude, here are my 'top tips' for fire service tyre husbandry best practice:

1 Select the right tyre for the job
In consultation with the appliance manufacturer and tyre supplier, services must first consider the particular vehicle's desired application. Once this has been established, the manufacturers can provide suggested tyre sizes for the vehicle as well as an appropriate tread pattern.

2 Weigh your vehicles
Following the selection of the tyre type, services should have their vehicles professionally weighed. Once the technical weighing exercise is complete, the tyre manufacturer's technical team should be able to offer bespoke tyre pressure settings for each axle on the vehicle type.

3 Maintain optimum tyre pressures
Services should adopt a consistent maintenance programme to ensure these pressure settings are maintained, while also making sure the tyres comply with legislation in terms of tyre condition. Services could consider making tyre maintenance part of the crews' daily routines as a team task, with responsibility shared among crew members.

4 Review your tyre policy
Utilise the tyre manufacturer's technical expertise to review and optimise your existing tyre policy. The Michelin technical team collectively has more than one hundred years of tyre industry experience with the company. Paying a little more at the point of purchase can bring multiple benefits in terms of increased tyre life, improved fuel economy, reduced downtime and, particularly in bad weather, enhanced mobility and safety. The difference in tyre performance from one brand to another can be significant

Firefighting is a tough, demanding job, but tyre husbandry needn't be. Advances in tyre technology, combined with proactive, in-depth analysis and regular maintenance, can help fire services get to the call quicker and safer than ever before. All that's required is some careful thought as to precisely what rubber your appliances should be rolling on.

For more information, go to www.michelin.co.uk



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- >33 minutes at-load run-time (>35 windshields charge)
- 20-minute charge time w/SMART charger
- 2-year limited warranty (except cutter blades)



Extrication – the importance of correct Personal Protective Equipment (PPE)

So as the 'shout' comes in and you get dressed in the appliance bay ready to attend an incident or you are in 'isolation' before your run at a RTC Challenge you will all be wearing PPE of one form or another. Generally this will consist of full firefighting kit or rescue kit, helmet with visor, eye protection, gloves (with medical gloves underneath), dust mask and boots.



Paul Maynard

The likelihood is that most of us will have and seen different types of firekit and that even your neighbouring service will have different styles to each other and at UKRO Challenges I have seen all manner of overalls and kit. So, what is right! I suppose that is predominantly down to you and your service but as we discuss this further, I would hope that this will promote discussion and encourage some of you to get more involved with kit procurement.

PPE is an area that is often discussed and it is also an area that has evolved greatly in recent times is. However, most FRS now have procured contracts that are managed for you and generally last for a number of years and so regular change is not always an option. Having said that, our PPE today has excellent qualities and can come in many styles and colours, but depending on your FRS, you may attend RTC's in standard fire kit that is worn at all incidents. As technology has moved on in all areas of equipment, so it has in clothing and now we have specific designs in wildfire, USAR and of course rescue.

In my 28 years on the run as a firefighter and officer as well as the 20 years as a member of the RBFRS Rescue Team, I have seen many types of kit used. It is at UKRO/WRO events that you will see teams from all over the world wearing all manner of kit, some of

▼ Overalls and Jacket worn by RBFRS Heavy Rescue Team



▼ Firekit worn by all RBFRS crews at an RTC



Images courtesy of Paul Maynard

Paul Maynard is an Area Manager with Royal Berkshire FRS and the current Response Manager. He is still active in the development of all RTC training and equipment within Royal Berkshire. He has been a member of the Royal Berkshire Extrication Team for nearly 20 years and led the team to three successive World Rescue Challenge titles from 2011–2013. Paul is now an Assessor for the United Kingdom Rescue Organisation (UKRO).

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Image courtesy of Holmatro

▲ A typical RTC showing PPE and casualty care equipment in use.

it good and some of it not so! However, it always promotes good discussion and especially abroad will lead you into discussions with manufacturers that are often exhibiting at these events. This has led to me being directly involved with some of the major PPE companies assisting their research and development. Also, these manufacturers assist in promoting some of these challenges so if you get a chance it is always worth having a discussion. It is also up to you to take what is new and perhaps "the way forward" back to your own FRS procurement teams and get involved in shaping the future for your service.

I am going to have a look at some of the PPE that is available to us and what we wear on the road and at challenges and what could work and offer us. I am also going to look at what equipment we should also have at incidents that is not directly PPE but is vital in our operations that provides safety to us and the patients we are rescuing.

Fire Kit or Overalls

In this case you are limited to what your FRS provides, but as your service looks to procure new kit, in my opinion the way forward is overalls. A number of services use these already and from my discussions with them, they are much preferred.

Generally they are much more lightweight and less bulky, ensuring that if the need requires you can squeeze into that tight space before time is available to create space. There are many designs available and you can have what you need added such as pockets, knee pads and built in loops and I also like a method of pulling in the end of the sleeves and legs such as elastic or Velcro.

In RBRFS our extrication team wear Derby-Unitex overalls as does our Heavy Rescue Unit who also has the addition of a jacket depending on situation, incident type or weather. We have found these to be an excellent addition to our PPE and our crews like them and having worn them myself I fully agree with them!

One item that I consider invaluable though not PPE but does link in are tool belts. In RBFRS we carry 2 on all appliances that the technical team will wear. As well as carrying a numerous array of hand tools they are also ideal for carrying spare PPE such as extra blood gloves/glasses and are much easier to access than a flapped pocket.

Helmets

Going back a number of years, we tended to have large bulky helmets and you would often see a number of them on the roof of a vehicle as we were working, but today there is a huge choice available and most are very snug fitting and comfortable. Most come with various in built glasses and visors and it is best practice that the glasses stay down for the whole extrication and the visor is generally only used for hydraulic operation and glass management.

I do see a number of extrication teams wearing separate glasses instead of the built in ones as they are generally smaller and more comfortable and also do not steam up as much. Our extrication team wear Bolle ones and they are extremely good and fit for purpose. If you do find the glasses and visors steaming up there are a number of products on the market such as 'fog off' which help keep them clear. In RBFRS we wear the Rosenbauer helmet and our extrication team wear Targa.



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Images courtesy of Paul Maynard

Gloves

Again these have evolved over the years and there are now many styles available. Most services have gone away from having one generic glove and now offer a rescue/extrication glove as well. My own personal favourite that I have used in the extrication team for many years, are Ringers which are extremely strong and puncture resistant. They have excellent dexterity and the palm and fingers are abrasion resistant and also an elasticated wrist that keeps out glass and debris. A number of extrication teams use them but anything that has similar qualities of these and you won't go far wrong.

Dust mask

These need to be fit for purpose and are generally only worn for glass management. They should always be put on as a matter of course and then just lifted into place as and when required. There have been many discussions across the world around the issues of glass dust and some countries have gone away from wearing them though in my opinion we should err on the side of caution until otherwise proved. In RBFRS we use the Sundstrom SR100 with a P3 particle filter and we actually ensure we undertake a quality test with our crews.

Boots

There a number of boots on the market for the rescuer and general Firefighting but I have recently come across these from HAIX with their latest creation, the Fire Eagle which has been developed for rescuers. It is a sleek and sporty functional boot, lightweight and flexible and equipped with all relevant safety features.

The most distinguishing feature of this boot is the two- colour toe-cap featuring signal yellow contour ripples. The two-colour design continues along the sole and aims at just one thing- maximum safety for firefighters during rescue work.

This boot has greater comfort and combines flexibility, minimum weight and protection features, the sole, toe cap and all other features of the boot have been adapted accordingly. The sole is exceptionally durable featuring fins combined with special grip elements and anti slip properties on wet ground and ice, mainly due to the two-compartment profile design.

The slight inclines in the toe and the heel area ensure smooth rolling over, while the movement sections are individually padded. These features provide the excellent comfort that is typically associated with sports shoes.

The Crosstech membrane technology from Gore® is breathable while keeping feet dry and protecting wearers against blood and other body fluids. Thanks to the optimised two-zone lacing system, it takes less than ten seconds to put on and lace up the boot, perfect for the emergency situation firefighters will be in when they have to wear the boot.

▲ Far left – RBFRS Rescue team medic overalls and vest with speedings soft protection. Top – Soft protection sheet in use. Above – A selection of casualty and crew protection equipment carried on all RBFRS appliances.

Patient PPE

Although not worn by rescuers, there are a few items of kit that must be used to improve patient comfort and safety. In my opinion, the patient sheet is a big deal and it should go over the patient as soon as is practically possible before work starts. In RBFRS we use one which has a clear vision panel in which will assist the patients welfare and also so that the rescuers can see them. We should also use Packexe to carry out glass management and I have discussed these techniques in previous articles. Finally as you cut you must provide sharps protection to protect everyone involved in the area and in RBFRS we use Speedings on all our appliances.

For more information, go to www.ukro.org





FIRE AND RESCUE NSW

Fire and Rescue NSW – Planning for the Future

The delivery of Fire, Rescue and Hazmat services in today's complex operating environment presents significant challenges for leaders within Emergency Services. Improving today's operational performance in addition to planning for the challenges and changes of the future requires a high level of integration across functional units within an agency, as well as close collaboration with other organisations.



Paul McGuiggan

Chief Superintendent Paul McGuiggan is a 30-year veteran firefighter and currently Assistant Director of Capability Management for Fire and Rescue New South Wales (FRNSW). Chief Superintendent McGuiggan is a USAR IEC Team Leader and in 2011 deployed to Christchurch NZ as part of Australia's USAR response to that earthquake disaster area. Recently Paul assisted the Swiss Government during the 2013 INSARAG earthquake response Simulation Exercise (SimEX) fulfilling the role of the UNDAC USAR Manager.

One Australian Emergency Service organisation has challenged and changed the way that they have previously developed operational capabilities and as such are improving operational service delivery and sustainability.

Fire and Rescue NSW is the largest urban fire service in Australia and is responsible for preventing and responding to fire emergencies, providing direct protection to 90% of the State's population in major cities, metropolitan areas and towns across regional NSW. They are the largest accredited rescue provider in NSW, as well as being the combat agency for the State's urban search and rescue capability. Fire and Rescue is the also the combat agency for hazardous material incidents and has capability to deal with chemical, biological and radiological hazards, including those resulting from acts of terrorism. In addition to these responsibilities, the agency supports the State Emergency Service during major storms and floods, and the Rural Fire Service during major bush fires. In some locations, they also assist the NSW Ambulance Service with medical first response.

Under Commissioner Greg Mullins leadership, Fire and Rescue has implemented an operational capability framework to improve its ability to better manage its service delivery

▼ NSW Firefighters removing debris and shoring up as they search the post explosion and fire debris in Sydney.



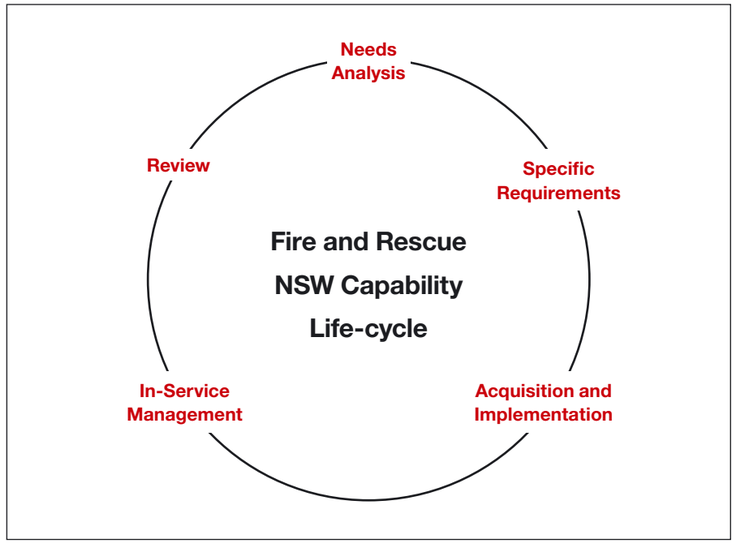
© Image courtesy of USAR

The development of Fire and Rescue's operational capability framework was undertaken by Noetic Solutions and is based on work undertaken by the Australian military. In order to define these services, Noetic worked with Fire and Rescue to develop a taxonomy of its current operational capabilities, comprising high level capabilities such as Firefighting, Hazmat, Rescue, Incident Management.

Fire and Rescue has a long and proud history of providing rescue services to the community of NSW. From its early involvement at major rescues such as the 1977 Granville train disaster, 1997 Thredbo landslide, the day-to-day industrial and motor vehicle accidents, through to its International Urban Search and Rescue deployments, their rescue operators have been at the forefront of rescue in NSW as well as on the National and International scene.

To ensure the organisation remained a leading rescue service Commissioner Mullins instigated a Rescue Summit which brought together firefighters from all over NSW to evaluate their existing rescue capability. The Summit assisted Fire and Rescue to build a shared understanding of its role in rescue service delivery – and explored the current and future possibilities. It also identified key issues for rescue capability and a set of priorities to develop a roadmap into the future.

Throughout 2014 the Operational Capability Directorate within Fire and Rescue led extensive consultation with all Operational Commands and key Directorates to develop an integrated whole of agency plan for rescue capability over the next five years. For Fire and Rescue, operational capability is the ability to deliver their services within specified time frames and then sustain that service delivery for the time required – whether it is rapid response to a structure fire or working



alongside the Rural Fire Service or the State Emergency Service for many weeks during a campaign event.

Fire and Rescue Chief Superintendent Paul McGuiggan commented that, "an operational capability framework provides us with the means to more closely coordinate our operations and corporate support functions, the intention of the framework is to assist us to conceptualise, generate and manage capability in a more comprehensive way, and by under pinning the process with good project management, we hope to better sustain our operations and improve service delivery".

The capability framework proposed for FRNSW comprises four elements:

1. A description of the seven inputs to capability; **P**ersonnel, **O**rganisation, **i**nformation, **S**upport, **T**raining, **E**quipment and **D**octrine grouped under the acronym **POiSTED**.
2. A capability taxonomy which provides a listing of all of the operational capabilities generated by FRNSW including their subordinate, or contributing, capabilities.
3. A Capability Lifecycle beginning with the identification of capability **Needs** and progressing through the definition of **Requirements**, the Acquisition of new capability or **Implementation** of changes to existing capability, the **Management** of the capability in-service and its eventual **Withdrawal** and Disposal.
4. A governance structure which aims to embed the needs of the capability lifecycle in Fire and Rescue's decision making processes.

POiSTED + Readiness + Sustainability = Fire and Rescue NSW Capability

The POiSTED inputs to operational capability are tightly integrated. This means that, while each input may not

FRNSW HAS A LONG ESTABLISHED HISTORY OF RESCUE CAPABILITY THESE ARE SOME EXAMPLES

1977	1997	1999	1999	1999	1999	2002
Grandville train disaster	Thredbo landslide	Sydney hail storm	Glenbrook train disaster	Turkey Earthquake	Taiwan earthquake	Lake Cargelligo water tower accident
2003	**2004**	**2011**	**2011**	**2011**	**2014**	
Waterfall train disaster	Indonesian Tsunami	Queensland floods	Christchurch earthquake	Japanese earthquake and tsunami	Bilgla sinkhole	

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have the same importance in delivering an operational service, they must be considered and addressed. Some examples of the POiSTED inputs to specific operational capabilities are:

Personnel

This input incorporates the recruitment, development and retention of people with the appropriate skills to deliver the services required. For firefighting, this includes the permanent and retained firefighters, as well as the trades and administrative officers required for the necessary support functions.

Organisation

This input incorporates the command and management arrangements to ensure that our operational processes are effective and that performance is monitored and evaluated. For our capability to respond to a terrorist incident, this includes maintaining partnerships with the NSW Police Force, Ambulance Service and the Australian Defence Force.

Information

This input incorporates information and communications technology, as well as the software and data that are used as the basis of decision making. For incident management, this includes the computer aided dispatch system, geographic information system, mobile communications, as well as the outputs from operational debriefs.

Support and facilities

This input incorporates the infrastructure and services that support operations for Fire and Rescue, including those administrative and corporate services associated with capability. For Hazmat service delivery, this includes our Hazmat technical servicing facility, as well as breathing apparatus servicing and cylinder filling stations.

Training

This input incorporates the training required for each operational capability and the ongoing validation of training against operational performance to ensure that it continues to meet our needs. Training is closely related to Personnel, Organisation and Doctrine. For rescue in NSW, this includes the public safety competencies established by the State Rescue Board.

Equipment

This input incorporates major plant and equipment, including pumpers, aerial, rescue and Hazmat vehicles. It also includes the acquisition and safe use of equipment required for specific capabilities e.g. personal protective clothing for structural firefighting, decontamination equipment for Hazmat, and hydraulic equipment for rescue operations.

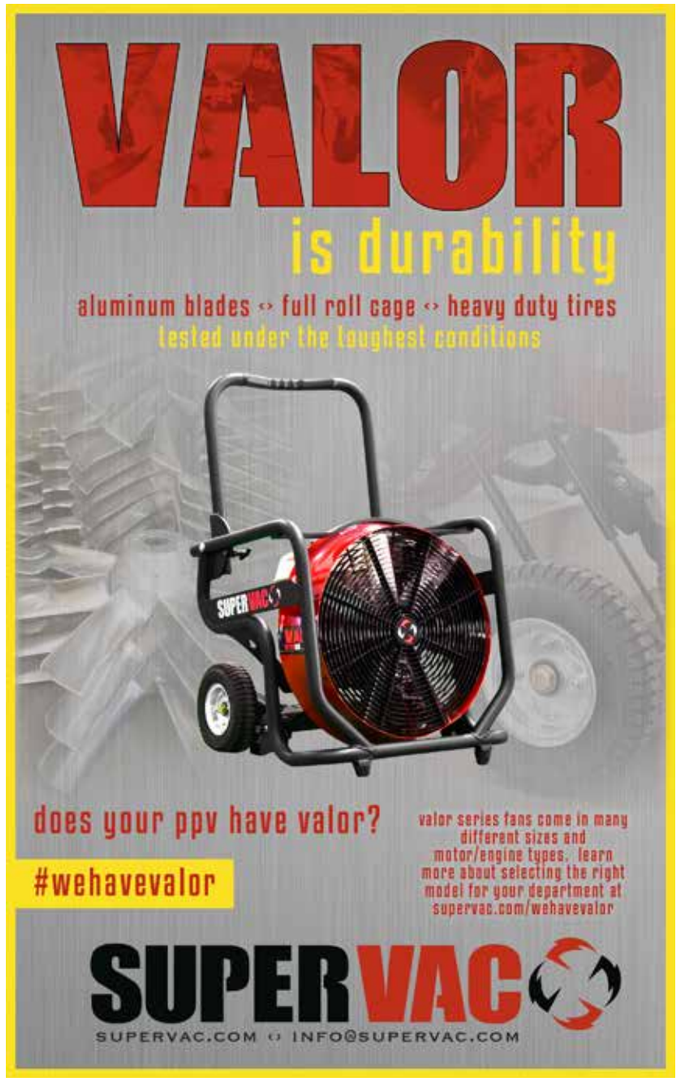
Doctrine

Doctrine is defined as “collective knowledge that has been structured and systematised to facilitate its application in practice and prepared for dissemination in a way appropriate for its intended audience” (AFAC, 2011, p. 2). It will enhance the effectiveness of operations through standardisation, provides a shared view of capability and is also the foundation of effective training. For Fire and Rescue, doctrine includes operational policy and procedures such as Standard Operational Guidelines and Recommended Practices.

▼ NSW Firefighters working with engineers and heavy plant to stabilise adjoining structures.



Image courtesy of USAR





FIRE AND RESCUE NSW CURRENT RESCUE CAPABILITY LEVELS

1 Rescue Operations	2 Rescue Operations	3 Rescue Technical	4 USAR Dom and International
Location 337 Appliances 547 People 7200+	Location 76 Appliances 106 People 1310+	Location 19 Appliances 34 People 380+	Location 3 Appliances 5 People 160+
■ All FRNSW firefighters are Level 1 rescue operators. ■ They receive recognised rescue training enabling competence in core rescue services as rescue operators. ■ They receive Basic Life Support training and provide initial rescue services across all FRNSW Fire Districts including road crash rescue. ■ Attain selected rescue units of competency in accordance with the Australian qualifications Framework.	■ FRNSW firefighters who are attached to primary rescue units are endorsed by the NSW State Rescue Board (SRB) as General Land Rescue (GLR) operators. ■ Have received recognised rescue units of competency in accordance with the SRB policy and are known within FRNSW as GRL rescue operators. ■ Have legislative responsibility for rescue operations within geographical areas as specified by the SRB. ■ Provide rescue support to level 1 rescue operators in both preparedness and emergency response	■ FRNSW firefighters attached to GLR units that can also provide other specialist rescue services such as USAR, vertical rescue, confined space and/or swift water rescue etc ■ Have proven rescue experience and provide rescue support to level 2 GLR operators and level 1rescue operators in both rescue preparedness and emergency response. ■ Have increased rescue equipment, training and overall rescue capacity.	■ Level 4 USAR technicians can respond internationally and are endorsed by the United Nations. ■ Have extensive rescue experience and provide rescue support to Level 3 rescue technicians and level 2 GLR operators in both rescue preparedness and emergency response. ■ Have capability that includes substantial rescue equipment usage, training and overall rescue capability. ■ Provide support to other accredited NSW emergency services accredited by the SRB.



© Image courtesy of USAR

◀ NSW USAR firefighters search small voids for any signs of life.

The implementation of an operational capability framework, with the appointment of a dedicated capability management branch, represents a significant change in the way that Fire and Rescue NSW will develop and manage operations. There is still a large amount of work to be done, but with the finalisation of Fire and Rescue's Rescue roadmap the organisations executive is confident that they have the building blocks of our new operational capability framework in place.

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For more information, go to www.fire.nsw.gov.au

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New Zealand USAR advances their technology capability

The USAR capability in New Zealand falls on the shoulders of the New Zealand Fire Service. Their taskforce has a pool of 210 people sourced primarily from NZFS personnel both career and volunteers. The early days of USAR back in the 1990's was a very different picture from what it is today.



Gavin Travers

Urban search and rescue was created by a small group of enthusiastic people who had the foresight of a USAR capability in NZ. They begged, stole and borrowed equipment including personal protective clothing to form the capability they strongly believed was needed for NZ.

On the 8th March 2015 New Zealand USAR underwent their INSARAG external classification in a bid to be classified as a "Heavy" team. They successfully achieved this after two and a half years of preparation and a significant financial cost and resource commitment. The Taskforce now known as NZL 1 were thrilled to receive 129 green and 7 yellow lights. The build-up was run with three work-streams running simultaneously and their associated project plans and cost allocations.

USAR Management Team – A new structure was introduced to provide a connection between the management of the team and the team members. The CAT3 component is all NZFS commanders who bring to the USAR command function a long and distinguished incident command level of experience. They lead the functional work-streams to provide governance and enabling to those work-streams.

Functional Work-streams – Membership is encouraged from each of the three geographically located teams. The work-stream provides a National and therefore consistent direction for the various functions within USAR. Equipment purchasing had been a problem area for us prior to the establishment of the work-streams.

After the Christchurch earthquake in Feb 2011 several independent reviews made recommendations for a new management structure. This also involved the introduction of the NZFS ranks into the USAR organisation structure. A National USAR Manager was appointed to provide direction domestically, engage with other domestic emergency response partners and to promote NZ USAR at a political and international level.

Information and Communications technologies are a rapidly changing environment and NZ USAR wanted to ensure they not only introduced a new electronic method of data collection and in a collaborative space to share that data but developed this on a platform the rest of the NZFS could consume.

The result was the following...

In 2014, the NZ Fire Service established a technology solution to support Rapid Disaster Assessment by the NZ Urban Search and Rescue (USAR) task force, also supporting NZ USAR External Classification as an International USAR Task Force [Heavy] under the United Nations International Search and Rescue Advisory Group (INSARAG) framework in March 2015. The solution is built on the NZFS ESRI enterprise technology platform and supports NZ USAR Domestic and International deployments effectively through incident ground data collection and resource tracking (using tablets and ESRI Collector for ArcGIS software), real-time situation awareness in the USAR Base of Operations and Coordination Centres to support Incident Controller and Task Force leader decisions (using ESRI Operations Dashboard software), and provision of near real-time intelligence to other agencies globally through Cloud-based data storage and delivery (ESRI ArcGIS Online). The solution meets the operational protocols, forms and workflows defined by the United Nations and INSARAG and are also being deployed to Civil Defence and Emergency Management groups throughout New Zealand to support the Ministry of Civil Defence and Emergency Management (MCDEM) requirements for a Rapid Impact Assessment solution.

The practicalities of this is a Samsung Galaxy Note 10.4 tablet with 3G and Wifi options for connection directly with the cloud or with a another new ICT component also developed by NZ USAR. The deployment case boosts the following features;

- 4 x Bearer source, BGAN, Wireless, WAN, 4G
- USB 2.0 and 3.0 ports
- 6 Port Ethernet with POE
- 2 x 1GB HDD in raid configuration
- 1 x USB External HDD for backup
- OS Windows server 2012
- UPS which allows 30 mins operation at full load
- External power source from a car battery, 110-240V supply
- Mouse, Keyboard and USB screen inside the lid
- Router with load balancing and priority between bearers
- The inside of the case is painted with RF resistant paint.

For more information, go to www.fire.org.nz

Gavin Travers is the National Operations Advisor (USAR) this role includes being the National USAR Manager based at National Headquarters in Wellington. He is a 32 year veteran firefighter and has progressed through the ranks to Area Commander.

▼ **New Zealand made, robust and portable it's a 'Solution in a box'.**



Image courtesy of NZ Fire Service

▶ **Progressing from 'pencils and notebooks' to electronic records.**



▼ **The built in screen provides access to system status and settings.**



Images courtesy of NZ Fire Service

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PERSONAL PROTECTIVE EQUIPMENT

Ergonomic personal protective equipment design saves lives

From turnout gear, helmet, gloves and boots, to self-contained breathing apparatus, Personal Protective Equipment (PPE) is designed to protect firefighters from the multiple hazards they face. In such a physical profession, where firefighters must work in bursts of intensive physical activity, how is PPE designed to ensure that they are not overloaded with the weight of the gear, or subjected to additional heat stress? The answer lies in ergonomic design.



Dr Richard Graveling



Janette Edmonds

Dr Richard Graveling is Principal Ergonomist at the Institute of Occupational Medicine (IOM).

Janette Edmonds is Director/Principal Consultant Ergonomist at The Keil Centre.

Richard and Janette are both members of the Chartered Institute of Ergonomics and Human Factors (CIEHF).

Put simply, ergonomics is the study of the work you do, the environment you work in, and the tools you use to do your job. "The goal of PPE design ergonomics is to design personal protection that fits you and the job you are doing" says Dr Richard Graveling, Principal Ergonomist at the Institute of Occupational Medicine (IOM).

2016 is an exciting year for the ergonomics profession. In recognition of the vital role ergonomics plays in the design of PPE, a new "Ergonomics design and evaluation of integrated PPE systems" working group met for the first time last October. Formed by the European Committee for Standardization (CEN), the working group has been set up to represent PPE in all sectors on a European level and will report throughout 2016 on progress.

Applying ergonomics principles to PPE design helps to ensure that it fits properly and doesn't interfere with work activities. Graveling cites the tragic case of a female police officer, stabbed to death after removing her stab-proof vest because it was getting in the way when she was trying to force entry to a property as part of a raid. "This case highlights the importance of getting it right – and the potential cost of getting it wrong. Studies have shown that PPE which doesn't fit properly or gets in the way (including clashing with other PPE) is less likely to be worn" he adds.

▼ **Locking in too much body heat can cause 'boil in the bag syndrome'.**



© Image courtesy of the Chartered Institute of Ergonomics and Human Factors



© Image courtesy of the Chartered Institute of Ergonomics and Human Factors

Janette Edmonds, Principal Consultant Ergonomist at The Keil Centre draws upon her experience designing body armour for the police. "Core ergonomics design principles are based on scientific research in biomechanics, physiology, anthropometry and cognitive psychology" she says. "The issues range from the most efficient and least harmful places on the body to carry loads, to the areas of the body where the skin is least sensitive to compression, and even which way a fastener should fasten" she adds.

Physical effects of PPE on the body

The work of Graveling's IOM colleagues led by Joanne Crawford revealed that by wearing fire kit, a firefighter's energy cost of simply moving around increased by 10 to 15 percent. Edmonds echoes this, citing physiological workload, muscular fatigue and strain and the potential for heat stress as key physical effects of wearing firefighter PPE.

Edmonds: "The addition of PPE typically increases the physical workload, biomechanical strain and thermoregulatory requirement on a firefighter's body. For example, we know that load carriage on the extremities, such as the feet, legs, arms requires more energy, than say load carriage on the hips. So, heavy footwear will require the body to work harder. The work of ergonomists has led to new designs which transfer load to the hips to decrease the strain" she adds.

Firefighters are regularly subjected to intense heat and physical exertion. PPE gear can exacerbate this, adding to the thermal burden. "Fire kit is very good at stopping heat getting in but also stops the heat the firefighter generates from getting out" says Graveling. One of the key findings of the research he and his colleagues conducted at the IOM raised the potential issue of overprotection. "When testing firefighters, we had them stand in front of large heat lamps simulating the heat load if they were working on a grass fire. The body was well protected inside – so much so that the outside of their garments became hot enough to burn your hand when you touched it, but the firefighter was alright. However, the physical effort meant that the firefighter gradually heated up inside". The series of studies carried out for the Home Office at that time demonstrated that there was a risk that, in seeking to provide the firefighter with more and more protection from the fire, there was a risk of locking in too much body heat (firefighters called this the 'boil in the bag syndrome').

▲ **A firefighter's energy usage increases by up to 15 percent when wearing fire kit.**

One of Graveling's and his colleagues other projects looked at fire hoods – the balaclava style fabric garment worn to protect the head. Interestingly, heat stress in firefighters wearing the hoods, was not significantly different to those who did not – despite concerns that, as a major avenue for heat loss, covering the head would have an adverse effect. One of the issues raised however, was a resistance from firefighters to cover their ears as many regarded them as heat sensors – when your ears start to burn, get out! Firefighters also raised the concern that their hearing might be impaired, making it harder for them to locate the source of sounds. However, testing revealed that the fire hoods had no significant impact on the firefighters' sound location. Through this research two human factors issues were addressed and, partly as a result of this work, firefighters are now routinely supplied with fire hoods.

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Image courtesy of Bristol Uniforms

An ageing society

In the UK today, almost a quarter (23%) of workers are 60 years plus, with this figure set to rise to a third (30.7%) by 2020. In the firefighting industry, does our ageing population bear any significance on PPE design?

In Edmonds' view, the issue is not just about age; it is about the health and fitness of the firefighter. "If a firefighter has a Body Mass Index (BMI) greater than 25, they would be classified as overweight or obese" says Edmonds. This is challenging when developing the size ranges and material shaping profiles of the garments. Graveling agrees: "It's a distinction between biological age, chronological age and behavioural age" he says. "There are a lot of older firefighters out there who are perfectly fit and capable and would meet existing fitness standards, however, there are also others where age is catching up with them, and the difficulty is, having a set retirement age is a one size fits all" he adds.

In terms of fitness, a firefighter's body needs to be capable of carrying the additional load. "A disproportionate body profile if you're out of shape, can lead to adverse biomechanical load and strain on the muscles and skeletal system that the design was aiming to reduce" says Edmonds.

Taking a police and security perspective, Edmonds expresses the necessity of providing adequate protection where body armour plates overlap. If someone is overweight, ensuring the proper fit poses more of a challenge. If there are gaps, say, at the sides or the abdomen, this could lead to exposure of the body and vulnerability to stabbing or gunshot wound in the case of the protective vests.

This was recognised by the development of a British Standard (BS 8469) on the ergonomics of PPE for firefighters (also written with IOM support). which examines many issues including maintaining protection in different postures.

PPE can only do its job if it is worn, fits correctly, and is fitted properly. Designing, procuring, providing and wearing PPE which has been ergonomically designed to meet the specific needs of workers is vital and helps to ensure that those workers go home uninjured and healthy at the end of the day.

▲ PPE can only do its job if it fits properly and is worn correctly.

Case Study

When London Fire Brigade needed to select new fire kit, they recognised that ergonomics characteristics were a fundamental feature of such kit. So they decided to include ergonomics testing of the fire kit on offer as part of the selection process. Supported by IOM ergonomists, a volunteer sample of London's firefighters carried out a series of standard tests, based on BS 8469. Graveling: "Tests covered the fit of the PPE – including when bending and stretching – and the impact of the PPE on a selection of firefighting-related tasks such as rolling out hoses and raising ladders. The results formed a major component of the selection scoring and helped to ensure that the capital's 5,000 firefighters were equipped with ergonomically the best fire kit on offer" he explains.

For more information, go to www.ergonomics.org.uk

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CASE STUDY

When seconds count: Disaster relief using augmented reality

On Saturday, March 22, 2014, at 10:37 a.m. local time, a major mudslide occurred 4 miles east of Oso, Washington in the North Western United States. The mudslide covered over 2.5 Km^2, buried 44 properties. More than 176 people were initially reported missing.



Erin Murphy

That morning, the Snohomish County Sheriff's Helicopter Rescue Team was ready to launch on a training mission in their Bell UH-1H "SnoHawk 10" when the request came to survey an area where a mudslide was reported. The magnitude of the situation was not initially known, but once the aircrew arrived on scene and grasped the immensity of the situation, additional rescue and aviation resources were called in. The aircrew immediately started conducting life-saving hoist rescue missions together with the first responding Fire agencies from Oso and Darrington. U.S. Navy Whidbey Search and Rescue arrived with their Sikorsky MH-60 and assisted in conducting hoist rescues.. Eight lives were saved that day due to the quick response and combined efforts of these agencies.

The responding aircraft, equipped with stabilized infrared imaging cameras and the latest augmented reality mapping systems were launched to be the "eyes in the sky" adding to the safety of the first responders and communicating valuable information about the scene to the crews on the ground. These air assets were able to provide a uniquely valuable perspective. The information that was able to be shared with the ground crews, decision makers and first responders utilized the latest technology that allowed the flight officers to toggle between live video and the pre-disaster aerial photography for a "before and after" view of the area.

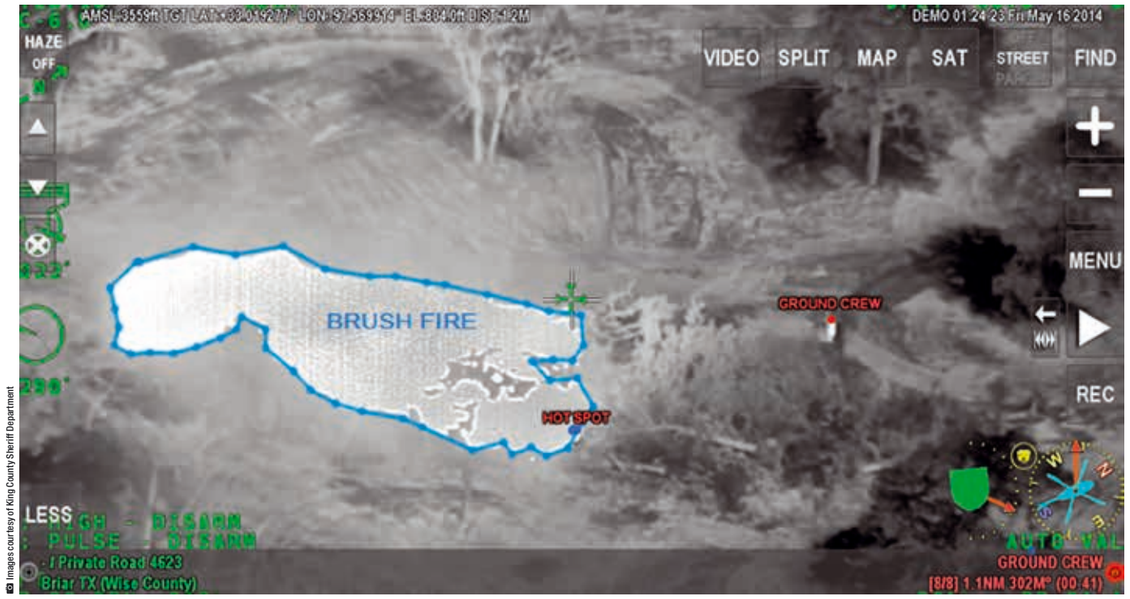
▼ **Churchill Navigation Airborne Augmented Reality System.**



Image courtesy of King County Sheriff Department

Augmented Reality is a technology that superimposes a computer-generated image on a user's view of the real world, or the integration of digital information with live video in real time.

Erin Murphy is Director of Sales for Churchill Navigation.



Images courtesy of King County Sheriff Department

▲ **Display of Fire perimeters, hotspots and ground crew locations over live video.**

This augmented reality technology also provided the aircrew the capability to display critical information including addresses, property boundaries and owner names of the homes affected by the disaster, overlaid on top of the live video. The aircrews were able to respond quickly to direct air and ground rescue efforts into the most devastated and populated areas.

Snohomish County Chief Pilot Bill Quistorf, recalls how the Augmented Reality technology aided them that morning, " During our first search pattern Deputy Espeland exclaimed "There were 40 homes out here!" "40 homes where?" I asked him. "Right here!" he answered and pointed to the gravel and mud below us. I then looked over at the ARS monitor and saw that we were flying directly over Steelhead Haven, a residential area that had contained a series of streets and over 40 homes. The Churchill ARS allowed us to verify that we were directly over the top of the small development. I hovered two to three feet above the debris field so we could conduct a detailed visual search and detailed thermal search of the residential area. "We did not locate any additional survivors in the main debris field, but due to the real-time moving map and map overlay features of the Churchill ARS, I was confident that we had searched the area with 100% search coverage. The ARS also allowed us to visually compare the historic satellite image of Steelhead Haven with the physical destruction that we were witnessed and then realize the totality of that destruction."

This Augmented Reality technology has proven to be an invaluable tool to first responders, supporting the expanded role of search and rescue, medical aid, and fire management missions.

Core capabilities such as the display of GIS information to include: addresses,

▼ **Overlay of house addresses and parcel information over the Oso Mudslide disaster area.**



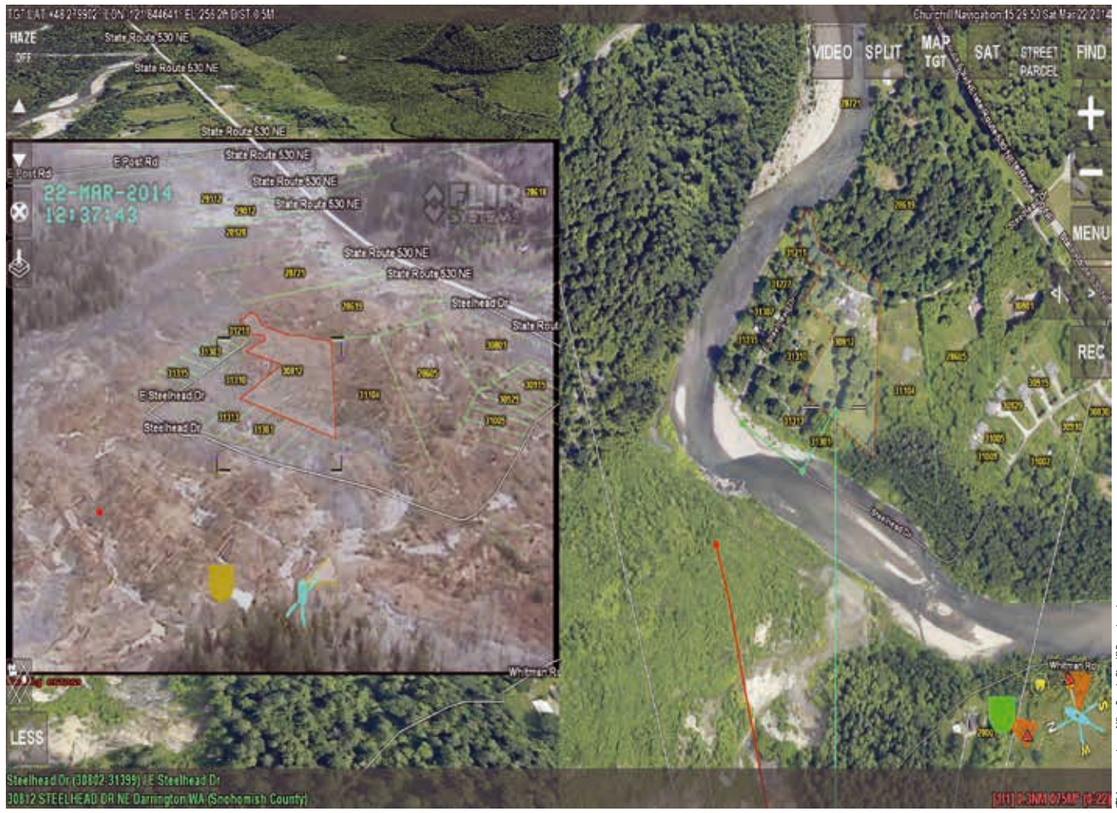


Image courtesy of King County Sheriff Department

▲ **Before and After – using synthetic imagery in the Oso mudslide.**

street names, businesses and hiking trails on top of the live EO/IR video gives the operator a clear picture of exactly where the camera is looking. This overlay view saves the crew from the struggle of correlating between multiple displays or having to fumble with map books for identifying locations. It provides immediate familiarity with the area and ability to share this information with those in need on the ground.

The synthetic imagery layer, comprised of 3D high resolution, color satellite imagery is linked to the camera view. It can be used to compare a color image of the area if viewing the video in IR or at night, to gather information about the target area prior to it being in view by the camera, to extend the field-of-view, or as used by the first responders in the OSO mudslide disaster, to show a before and after comparison of the disaster area.

Search patterns can be calculated and displayed on-screen and the camera can be set to automatically follow the line of the pattern at a designated speed. Perimeters can be drawn around fires or areas of interest and locations can be marked and saved. To aid in reporting and information sharing, this information is easily exportable to Google Earth or ESRI Explorer type programs.

The airborne augmented reality system also adds mission management capability, interfacing and controlling a wide range of external equipment including steering the camera and searchlight, commanding the controls for the downlink and interfacing to a wide range or RADAR type targets. Targets such as emergency vehicles (AVL), boat locations (AIS), air traffic (TCAS or ADS-B) and even cell phone locations (when logged into a server) can be displayed over real-time video in the aircraft for up to the minute display on pertinent information and locations.

As other technologies are added to the platform these can also be integrated, bringing a heightened level of situational awareness. One such example is the integration of a Mobile Ad-Hoc Mesh network. These radios, which transmit voice similar to a traditional Motorola, are capable of self-forming networks which relay voice and data through intermediary radios. The ad-hoc mesh network can be used to transmit video to the ground, similar to a downlink system. Moreover, the radios can broadcast their GPS location (which some Motorola radios can do as well). The location signal can be integrated into the Augmented Reality mapping system on the aircraft, displaying an icon representing the firefighter or ground personnel over the live video from the gimbal in the aircraft – either in the air, or back on the ground (to the firefighters themselves, over the same mesh network, or at a command station). This not only gives the air crew the ability to easily direct the rescue forces to the most necessary areas, but provides the added and much needed capability to know the exact location of the ground teams and to keep them out of harm's way, adding to the safety of our ground forces and decreasing the loss of life.

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TRAINING

The case for training all responders in preservation of evidence

It is a rare firefighter who, in the excitement of a fire event, thinks of a fire scene as a place filled with valuable forensic evidence. Although we may think of the fire itself as the reason evidence is destroyed or compromised, the activities of firefighters and first responders can be just as damaging to physical evidence. Unnecessary evidence alteration or destruction can impair the ability of governments and others to determine the origin and cause of fires and to resolve the legal proceedings and disputes that result. In extreme cases, it can expose the agency to criticism, negative publicity, and potential legal action.



George A. Codding

George A. Codding volunteers as a firefighter and fire investigator for a fire department in Colorado, U.S.A., and works as a prosecuting attorney for the state government. He has served as chair of a multi-agency investigation team. He is a member of the International Association of Arson Investigators (IAAI), where he has served as a committee chair, text reviewer, chapter president, and director. He is currently First Vice-President of the IAAI, and will become President in April, 2016. He has a Juris Doctor law degree, and holds the IAAI's Certified Fire Investigator (CFI) certification. He has published several articles on legal and investigation topics, and has presented on legal, methodology, and investigation subjects in English, French, Spanish, and Portuguese.

Most fire safety professionals know that the causes of fire must be understood so the public can be educated how to prevent future incidents, and so safe and reliable products can be designed and sold. Understanding what causes fires depends on good fire investigation, which includes a thorough analysis of all of the physical evidence at a fire scene.

Every fire investigator from any agency or business should receive training in identification and preservation of evidence, whether or not the investigator's duties include evidence handling. Just as important, firefighters and first responders to a fire scene should also be trained on actions they can take to avoid compromising the evidence that is needed to make a just, accurate determination of the cause of a fire.

▼ **The hard work and conditions of firefighting mean that evidence can and often is inadvertently compromised by firefighters.**



© Image courtesy of George A. Codding

Firefighters and First Responders

Fire scenes are often attended by first responders other than the fire department, including industrial fire brigades, police, private security, and military. It is easy to picture the ways in which a first responder could innocently compromise physical evidence. Firefighters and hoses move freely through burnt and unburnt areas of a scene. Personnel enter scenes with tools that run on petroleum products like gasoline, potentially transmitting those products to fire debris. People walk through fire scenes out of interest and curiosity, bringing potential contaminants in on their shoes and clothing.

Training for these responders can be provided by the agencies responsible for the investigations in their jurisdictions. It should include the importance of fire evidence in the legal system, recognizing items that might constitute physical evidence, ways to mark and report locations of evidence, and the ways in which contaminated clothing, footwear, and equipment (as well as the activities of ordinary firefighting) might compromise fire evidence.

Understanding that suppression and overhaul activities are necessary in a fire scene, firefighters should follow the following guidelines to assure that they do not contribute unnecessarily to compromise of evidence:



© Images courtesy of George A. Codding



▲ **Electrical evidence is often fragile and should not be disturbed unless necessary for fire suppression.**

▶ **Evidence markers in a fire scene.**

- Recognize that physical evidence may exist anywhere in a fire scene, whether or not the area in question has been affected by fire. Take efforts to not disturb or move property, turn switches and knobs, or examine objects or appliances without good reason. Things that do not seem like they should be evidence could nevertheless be important to the investigation.
- When possible, extinguish fire with minimally necessary amounts of water, and restrict the search for fire extension ("overhaul") to only those activities needed to assure that the fire has been located and extinguished. Avoid the temptation to remove property or otherwise clear the scene or the fire room without approval from the investigator.
- When electrical circuit protection must be turned off to protect people or property, do so in a way that preserves branch circuit protection for inspection by investigators. For example, circuit breaker panels often have "main" breakers that control all of the circuits in the panel. Switching the main breaker off allows the branch circuit breakers to remain in the position they occupied before the arrival of responders, affording valuable information to the investigator. If possible, prevent utility personnel from removing parts of the system, such as gas appliances and meters, until they are inspected by investigators.
- Take extra care to not bring petroleum products such as gasoline (petrol) into the scene. Refuel tools away from the fire area, and if possible, avoid using power tools in the heaviest areas of fire damage. Heavy motorized equipment should not be used on a fire scene without prior consultation with the investigator.
- Restrict personnel who enter the scene to those whose presence is necessary to accomplish suppression of fire. Department personnel can be posted at entries and exits to keep track of who has been in the fire area.
- Protect items that appear to be potential evidence by marking their location, diverting personnel away from them, and bringing them to the attention of commanders and investigators.
- When possible, maintain walking pathways through fire scenes. This permits personnel to work within a scene while preserving most areas from being compromised by travel. Similarly, pay attention to where hoses are moving, and take efforts to prevent hose streams, as well as the hoses themselves, from doing unnecessary damage.

The International Association of Arson Investigators (IAAI) encourages the training of firefighters and first responders in preservation of evidence. The organization, composed of 8,300 public and private investigators, engineers, scientists, and insurance personnel from 66 countries who are involved in the investigation of

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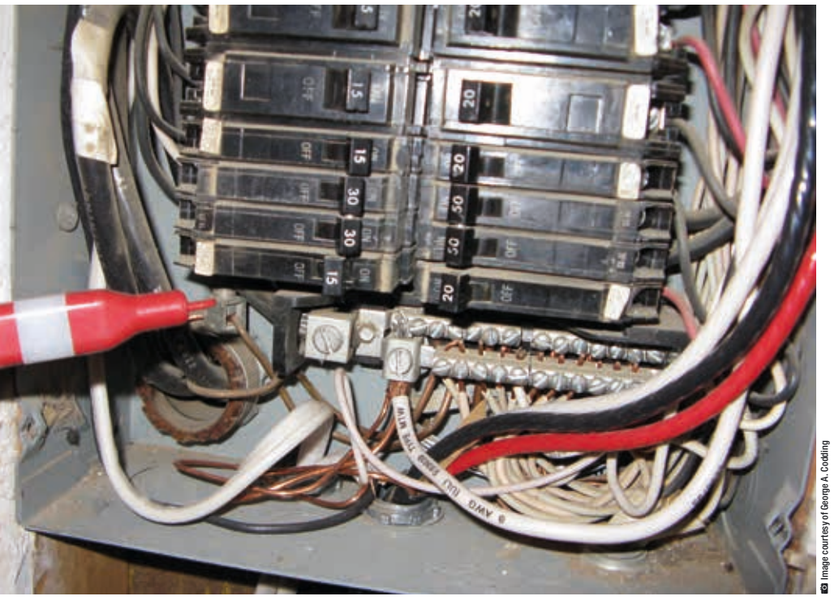


Image courtesy of George A. Codding

▲ If circuits can be made safe without disturbing branch circuit breakers, valuable information remains for the use of fire investigators.

all types of fires, has published a video that describes steps that can be taken by firefighters and first responders to help preserve fire evidence for later investigation and inquiry. The video is accessible on line at: https://www.firearson.com/Publications-Resources/First-Responders-DVD.aspx

Investigators

Depending on the jurisdiction, public authorities may or may not be involved in the investigation of a given fire. Many fires are investigated by privately employed investigators or engineers. Some investigators handle and collect evidence, while others are obliged to alert police services for handling. In yet others, the close examination or forensic testing of physical evidence may not occur unless there is a legal process or insurance dispute, necessitating the involvement of privately employed investigators.

Investigators without the proper training are at great risk of compromising the evidence physically, and/or of being unable to demonstrate that it remained intact up until the time of testing or presentation in court. For example, trouble can arise if an investigator uses unclean tools or containers to collect fire debris; uses a container that is not appropriate for the type of evidence involved; disconnects electrical evidence at an incorrect point in the circuit; fails to use new gloves and clean tools for each collection of debris; allows his or her DNA to mix with samples being collected; inadequately documents the chain of custody of a piece of evidence; or stores and transfers evidence inappropriately.

The U.S.A.-based National Fire Protection Association (NFPA) promulgates consensus-based standards and codes relating to fire and life safety that are recognized and followed in many parts of the world. NFPA 1033, Standard for Professional Qualifications for Fire Investigator, addresses the expectations for fire investigators in all sectors of the industry as to the preservation and collection of evidence with several job performance standards.

All agencies and businesses employing fire investigators should provide and encourage training that follows the roadmap provided by NFPA 1033. Credentials and certifications for fire investigators should include testing on evidence topics. The credentials offered by the IAAI are becoming widely recognized in the world, and are based on the standards of NFPA 1033 and the prominent investigation guide, NFPA 921. These credentials include testing on evidence topics.

One IAAI credential, Evidence Collection Technician (ECT), includes a practical test in which the candidate collects and packages a variety of types of evidence (such as ignitable liquids and fire debris) with a proctor who uses a procedural checklist to verify that the candidate has successfully performed the requisite elements of safety, skill, contamination prevention, and chain-of-custody documentation. The candidate who passes the ECT comes away with a credential that attests unequivocally to his or her evidence collection and preservation skills.

Regardless of the source of the training, education of fire investigators should include at a minimum the following:

- Decision making as to whether evidence should be collected
- Appropriate tools for evidence collection
- Importance of cleanliness of tools and equipment
- Cleaning methods for tools and footwear
- Contribution of uniforms and boots to evidence compromise
- Collection methods for fire debris, fireworks and incendiary items, ignitable liquids, clothing, blood, DNA, toolmarks, electrical items, and other categories
- Appropriate containers for the different types of evidence, and the different types of tests that might be necessary
- Handling of electrical evidence
- Appropriate documentation of the evidence collection procedure
- Appropriate handling, storage, tracking, and transmittal of samples

Investigator training includes modules available on IAAI's free web training platform, www.CFITrainer.net.

Conclusion

Public safety is enhanced when the causes of fire are determined, and proper fire investigation is the key to determining causes. When fire evidence is preserved, there is a far greater likelihood that a fire investigation will be successful, and that later governmental inquiries or legal proceedings will be well-informed. Agencies and businesses should assure that their personnel are well trained in identifying, preserving, and where appropriate, collecting and storing fire evidence. Such training is essential not only for investigators, but for all personnel who respond to fire incidents.

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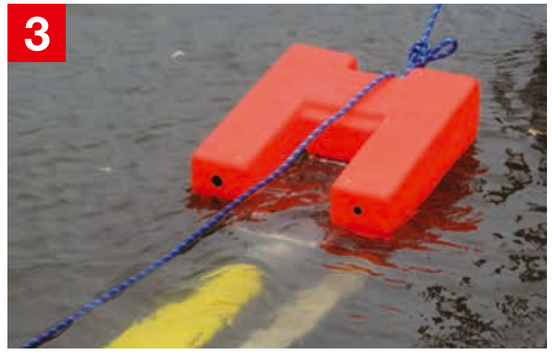
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SOLAR POWER

Solar power: Enabling new capabilities for emergency services

September 12, 2015: Lake County, California. A fire starts and expands rapidly just north of the California wine country. It takes over 200 fire personnel and equipment to finally contain the fire. The aftermath: over 700 square kilometers burned. With over $1.5 billion USD in economic losses, this fire is one of the costliest and largest in U.S. history. Four civilians dead and four firefighters seriously injured. Every year, over 100,000 wildfires occur in the U.S. and they can double in size every five minutes. For wildfires, just as with any emergency situation, early detection and quick response are key to containment.



Rob Parenti

Rob joined the product marketing and engineering team at Alta Devices in January 2015. His primary role is integrating Alta's solar technology into their customer's final products. Prior to joining Alta Devices, Rob served in the U.S. Air Force as an engineer primarily analyzing the feasibility of various next gen defense systems. Rob holds a M.S. in Materials Engineering from the University of Dayton and B.S. in Aeronautical and Aerospace Engineering from Purdue University.

Solar Power To The Rescue

Although there are many tools currently available for early detection, it is hard to use these same tools in remote or very large areas where events like wildfires occur. Wildfires can be particularly difficult to predict because they can start anywhere at any time. However, if we could bring some of the tools currently available, like smoke sensors, and apply them to vast remote areas it could increase the likelihood of early detection. The biggest obstacle to deploying these tools is the ability to keep them powered. To power these tools, we need a power source that can last years with minimal to no maintenance. Batteries alone do not provide the answer and therefore we must turn to renewable energy sources. The most portable and reliable of these energy sources is solar.

▼ **Applying solar to existing platforms, such as the AV Puma UAV below, could assist in the early detection of wildfires.**



Image courtesy of Alta Devices

What Is Solar Power

Solar power is a generic term for any material that takes incoming light and converts the light into usable energy. More technically, this material is known as being photovoltaic. In 1954, Bell Labs invented the first practical solar cell using silicon as the photovoltaic material. Silicon is still used in the majority of solar/photovoltaic cells and they are generally assembled into large panels on commercial and residential roof tops or are part of large installations on vast amounts of land. This ubiquitous solar technology generally supplements the electrical power grid. Traditional silicon-based solar is abundant and relatively inexpensive. However, it is bulky, heavy, and provides low to modest power output. In general, silicon-based solar is not practical to power remote tools, like the ones needed for early detection and quick response for emergency services.



Image courtesy of Alta Devices

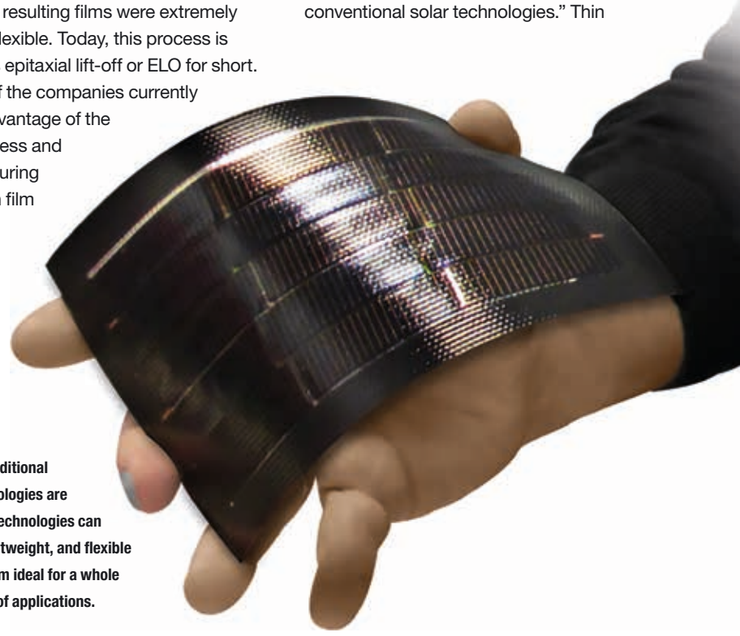
▲ **Aircraft like the AV Puma (pictured above) are easily deployable and can stay in the air all-day with the addition of solar power.**

A New Type Of Solar Power

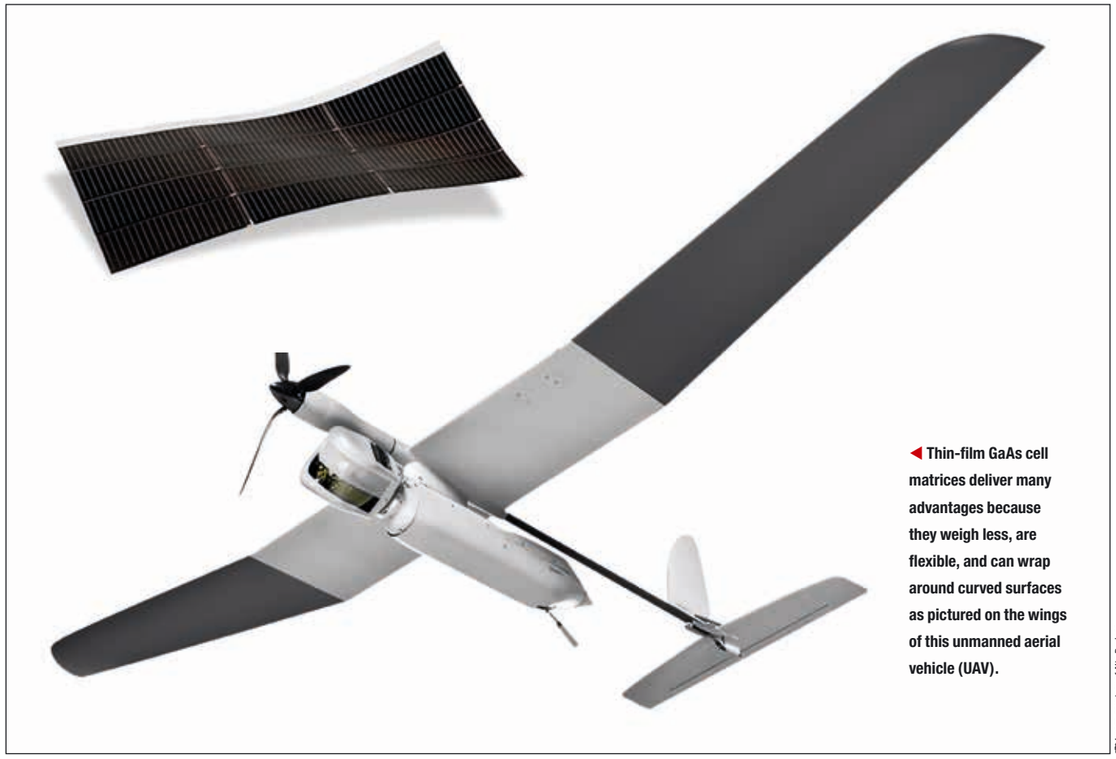
To power devices like small remote sensors or unmanned aircraft we need a solar power source that is small, lightweight, and has high power output. One of the best photovoltaic materials on Earth is gallium arsenide (GaAs). In 1970, the first GaAs solar cell was developed by Zhores Alferov in Russia. GaAs has some significant advantages over other materials: it is naturally inert and resilient in most environments and it has a very high power density (more power for the same surface area). GaAs superior performance was immediately evident, but the material had a significant drawback: cost. GaAs was 200 times more expensive to produce than silicon. Additionally, its traditional form is also bulky and heavy, like silicon-based solar. There are methods to decrease the weight of traditional GaAs, but these methods only increase the end product cost. As a result, GaAs has been used almost exclusively in space over the last 45 years. Again, due to its high cost and weight, traditional GaAs is not practical for remote power. But what if there was a way to take all of the great advantages of GaAs and lose all of the disadvantages. Luckily, a solution like this already exists.

In the 1980s, renowned PhD physicist Eli Yablonovitch pioneered a technique to remove thin layers of GaAs from expensive GaAs wafers. By removing thin layers, the GaAs film retained all of the properties of traditional GaAs solar technologies, but the underlying wafer could be reused to save cost. The resulting films were extremely thin and flexible. Today, this process is known as epitaxial lift-off or ELO for short.

One of the companies currently taking advantage of the ELO process and manufacturing these thin film GaAs solar products is Alta Devices (co-founded by Yablonovitch) located in Sunnyvale, California. Gang He, Alta Devices CTO, gives his perspective about thin GaAs, "What makes this technology so special is that it combines the most efficient material for solar applications and puts it into a thin and lightweight form factor. This combination makes it ideally suited for a whole new class of applications that are not addressed by conventional solar technologies." Thin



▶ **While traditional solar technologies are rigid, new technologies can be thin, lightweight, and flexible making them ideal for a whole new range of applications.**



◀ Thin-film GaAs cell matrices deliver many advantages because they weigh less, are flexible, and can wrap around curved surfaces as pictured on the wings of this unmanned aerial vehicle (UAV).

Image courtesy of Alta Devices

film GaAs solar can add significant value to existing products by increasing product operability lifetime. Solar can be retrofitted to existing optical, infrared, gas, and smoke sensors. This means that thousands of units of early detection equipment could be placed within disaster prone areas and left unattended.

Combining New Solar Technology with New Tools

Thin film GaAs can also add value to new tools being developed for emergency services such as unmanned aircraft. In late 2014, NASA signed an agreement with the Department of the Interior's U.S. Fish and Wildlife Service to test small unmanned aircraft for the detection of brush and forest fires. Although results of the tests have not been published to date, the State of Virginia's Great Dismal Swamp Refuge manager Chris Lowie is hopeful, "…airborne unmanned platforms and their ability to offer a safer and more cost effective alternative for surveillance of potential areas of interest…as well as a reduction in time to detect nascent fires…could potentially save millions of dollars to the taxpayer…" The particular unmanned aircraft being developed uses both visual and infrared cameras to detect fires. However, current flight times are limited to an hour which limits both the range and usability of the aircraft. If this aircraft utilized thin film GaAs solar on its wings, it could potentially quadruple the range making it a better fit for the large areas of land where wildfires normally start.

Keeping Sensors Powered By The Sun

Another new technology that would benefit from the addition of thin film GaAs are wireless sensor networks (WSN). WSN are spatially distributed autonomous sensors that typically monitor environmental conditions. The individual sensors collect data and pass the information to a central hub where data from the sensor network is combined. This collective data is than used to create a depiction of the environment being monitored. The technology emphasizes low cost, power consumption, and promotes the use of solar to keep them powered. In other words, a network of sensors could be placed within fire prone areas to increase the chance for early detection. If the fire grows, the network will be able to track its movement through the collection of environmental conditions. Finally, combining WSN devices with thin film GaAs solar cells allows them to be left unattended for extremely long periods of time without maintenance.

Summary

Imagine if the emergency response team in Lake County, California had a network of remote firefighting tools at their disposal. Thousands of ground sensors capable of detecting environmental changes coupled with small unmanned aircraft patrolling the sky with optical and infrared cameras in search of flames. All enabled and powered by thin film GaAs solar cells. How much destruction could have been prevented through early detection and predictive fire mapping? While we cannot change the past, we are certainly entering an era where WSN and unmanned technologies are converging to provide emergency services with new tools to help fight remote events all powered and enabled thanks to thin film GaAs solar.

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Introduction

TEISEN produced its first firefighting hose in 1903, and since then, it has been the most experienced and largest firefighting hose manufacturer in Japan.

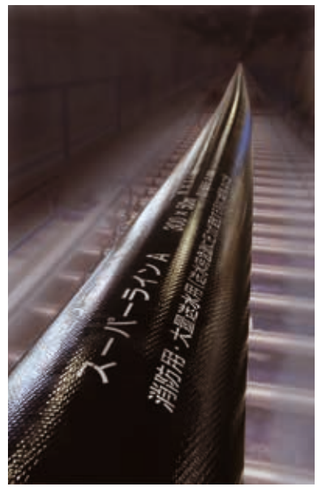
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TEISEN offers the Super Line LDH with a diameter of up to 300mm. Super Line LDH is manufactured using a one-piece construction method, extruding the cover and lining in one step, with polyurethane through a polyester jacket.

Features

- Minimized pressure loss
- Compact storage through a new kind of rubber-like, polyurethane material
- Available in long lengths
- Excellent resistance to heat, fuel, chemicals, UV, ozone, weathering, etc.





Diameter	mm	100	150	200	250	300
	inch	4.0	6.0	8.0	10.0	12.0
Color		orange	orange	orange	black	black
Wall thickness	mm	3.5	3.5	4.0	4.6	5.0
Weight	kg/m	1.1	1.6	2.8	4.0	4.8
Burst pressure	MPa	4.2	4.4	3.6	3.0	2.8
Maximum working pressure	MPa	1.6	1.6	1.4	1.4	1.4
Temperature range	℃	-20℃～50℃				

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International fire fighting, becoming the 'norm'?

Dry winter conditions created a Canadian fire season which was dominated by an unusually large number of forest fires, some in Boreal Forests that typically don't burn. Area burnt by forest fires in the Northern hemisphere continue to set new records in the 21st century, and 2015 is likely to see this trend continue. As Canadian fire fighting resource became depleted the Canadian Interagency Forest Fire Centre (CIFFC) initiated a request for support from outside Canada.



Ian Tanner

Ian Tanner is a recognised leader and practitioner of fire management in South Australia. He has considerable fire management experience, and has been engaged as the Senior Regional Fire Management Officer for the Department of Environment Water and Natural Resources (DEWNR) since early 2004.

On Monday 6th July 2015 David Nugent, Parks Victoria and Ian Tanner, Department of Environment Water and Natural Resources arrived in Winnipeg, Manitoba, Canada. Sent forward, with only a few days notice, to support arrangements between CIFFC and Emergency Management Victoria (EMV). This resulted in 47 Australian fire fighters being deployed into Alberta and 52 into British Columbia from Emergency Service Organisations around Australia. Support to Canada was also provided by the United States, New Zealand, South Africa and Mexico.

So why Australia? Australia is well placed to assist with forest fires in Northern America. Incident management here is managed using the Australasian Inter-service Incident Management System (AIIMS) which is very similar to the Incident Command System (Canada) and the National Incident Management System (United States). Providing easily transferrable skills and knowledge between countries. For some the most difficult adjustment is which side of the road to drive on, and tipping!

There has been a long standing relationship with Canada and the US which was developed through the forest industry managing forest fires. Since the 1950's Forestry agencies have engaged each other through international study tours and exchanges. Today many forestry agencies in Australia are part of, or work very closely with, other land management agencies like Parks and Water Authorities. Together they are often referred to simply as the "land managers". Across Australia these land managers and the other emergency service organisations have also evolved, they constantly improve in order to provide a more seamless and professional service to the community. We work as one under the principles of AIIMS to ensure that we are all providing best practice emergency management. Supporting Canada was no different as all Emergency Service Organisations (ESOs) around Australia worked to assemble a multi-agency team to fulfil the request.

▼ **Alistair Drayton Australian IC and Cameron Leary Australian Operations Section Chief are discussing control options with Dan Dykens, British Columbia Forest Service on the Cougar Creek Fire 247 in 2015.**



© Image courtesy of Ian Tanner



© Image courtesy of Ian Tanner

▲ **Australian Ignition Specialist (IGSP) Brett McNamara has some down time with the Canadian Aerial Ignition Crews at the China Knows Fire 116 in 2014.**

Logistics – unsung heroes

In 2015 there were two international deployments, both managed by Emergency Management Victoria (EMV), in liaison with ESO's from around the country. Many Australian fire fighters perhaps wrongly assume that all they need to do to assist another country is get on a plane and find out about some local practices. They may be surprised to learn about the significant amount of work that occurs in the background. This coordination role and the significant amount of work that is required generally goes without recognition.

Here is a small list of some of the many challenges that you may be presented with in order to fight fires another country;

- Suitability of personnel. Be appropriately trained and experienced and then, depending on the role meet fitness standards. In Northern America you will need to achieve an 'arduous' fitness classification to be allowed to work on the fire ground.
- Information needs to be gathered, prepared and provided to fire fighters before they leave home. Allowing them to prepare and pack the appropriate equipment. There are often weight and bag restrictions when working on fires in Canada and the US.
- Logistical considerations, How to get fire fighters from around Australia to the host country safely and in a timely manner. EMV were able to get over 100 people onto one flight from Australia to Vancouver in 3 days. A considerable achievement.
- Australian agencies, as employers, need to ensure that Occupational Health Safety and Welfare provisions have all been considered and met. Each agency will have slightly different processes that need to be accommodated, as will the host country. Safety will not be compromised.
- Immigration will need to be addressed. Often involving the US as they are a stopover to get to Canada.
- How to maintain communications with home. Particularly when fire crew are deployed into remote forest locations for up to 14 days. There may be long periods without the ability to talk to home.

Australian fire fighters will perform at their best if they are engaged in accordance with their competency, training and experience. Success and reputation relies on good communication between countries regarding the tasks to be undertake and the skills required. As fire fighters we understand the challenges that different topography, weather and fuel types present. Fighting fires in the forests of Northern America is unique and specialised work. They cut 'guard' (control lines) for kilometres and then run canvas hose from a lake, through pumps, to supply water for mopping up. Perhaps more akin to an irrigation system than a fire fighting operation. The Canadians use a lot of aircraft and availability of large volumes of water in relatively close proximity of fires is common. In order for these overseas missions to be successful fire fighters deployed need to be confident in their abilities, and adaptable to the new techniques that are employed.

Development benefits

There are many benefits to individuals, organisations and the Australian community that come from international deployments. We learn new skills and test existing ones. Consider the importance of the interagency and interstate relationships developed between Australians while deployed. It is well understood that teams function more effectively if there are established relationships. Therefore these new relationships between Australian fire fighters is a massive benefit to Australian

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Image courtesy of Ian Tanner

communities when these professionals come together during times of greatest need, the large fire events that require interstate support. The more often our fire fighters work together the better the service to our communities when most at need.

The experience

Whilst fighting fires in the Northern Hemisphere is unique and specialised work there are many similarities with fire fighting in Australia. It is hot, dry and hard work. However, there are some notable differences. Canadians seem to think Australia has lots of dangerous animals, on the other hand Australians seem to think bears and cougars are more of a concern than spiders and snakes. I guess it is what you are used to.

Great to meet new people and different cultures. With the Canadian deployment fire fighters experienced working with firefighters from Mexico, South Africa and United States as they all worked to support the local firefighters. They met some great and interesting personalities and one of the highlights was the South African crews singing at the start of shift. Imagine how this would work in Australia, a bit of Cold Chisel before the briefing?

The Northern American Forests are often postcard views with large salmon filled rivers of cold water. The nature of bushfires and wildfires means that we are often required to work in beautiful places, one of the rewards of a difficult job. We generally don't expect to be up to our knees in a swamp, which was the case for our fire fighters in parts of Alberta. As they worked in the "Muskeg".

Accommodation is in fire camps. One of the most rewarding experiences for those deployed overseas. How to place a fire camp? There must be a training package for the people that locate fire camps. They need to be on ground that is particularly uncomfortable, a quarry or paddock full of long grass. Generally situated close to transport, ideally between a highway and a railway line. Then you bring in all the facilities and a couple of big generators to compete with the rail and road noises. And if you are really lucky the airbase is co-located. You get to sleep in a tent, use portable toilets and showers. If you didn't pack a towel, the camp may supply a meter of paper towel for your shower. If you are not a lover of camping, then forest fire fighting may not be for you.

Deployments typically last for 14 days with 2 days off and then another 14 days. Then you are returned home. You can expect to have a day or two of briefings and orientation. This includes your chance to get over the jet lag. Australian firefighters are typically deployed in teams or sometimes down to pairs. You may find yourself deployed as an individual resources working in a remote area with the locals. This is perhaps one of the most rewarding opportunities and may be one of the most daunting depending on the individual.

▲ **Early morning at case camp for the China Know Fire, 2014. The tents in the foreground are our luxury accommodation for our 14 day shift.**

A national approach

With the increase in large fires around the world there is a growing preparedness by countries to be able to provide international support. EMV has done an excellent job in managing the 2015 deployments but should not be expected to carry this burden on behalf of the ESO's indefinitely. Emergency Service Organisations around Australia are working on a way forward. As a sector we continue to work more closely together as we strive to provide the most professional service possible to the community, both here and overseas. It is logical to assume that we will also master international deployments in time.

Are you prepared

So you want to fight forest fires in the northern hemisphere. Then you need to be prepared. Forest fire experience in Australia is an important box to tick. You need to have a valid passport. You need to be prepared to experience the challenges described above and the typical fire scenarios, like mop up. And you need to do it all while representing us, as Australians, in a professional way. You will be challenged, bored, frustrated, cold, hot and tired. And that's just getting through customs. If you can tolerate the frustrations, you will have opportunities to be inspired and impressed with what is ultimately a very rewarding experience.





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Better procurement needed in fire and rescue operations

The need for fire-fighting and rescue organisations to optimise their costs is not a new concept, but it is fair to say the challenges of managing the spiralling costs and increased demands on resources are only continuing to make the landscape more complex.



Sigi Osagie

For most fire and rescue organisations, purchasing spend is the largest or second largest area of expenditure. Consequently, Procurement departments have been expected to deliver greater financial value improvements in recent years. Public sector bodies have been forced to find ways to secure more value from every pound they spend in supplying services to their end-users.

It's no surprise that for many fire and rescue organisations, trying to procurement efficiency without compromising standards can become like the search for the proverbial Philosopher's Stone.

Cost containment isn't the only reason for the increased focus on purchasing. Averting fraud and other business risks, like the recent horsemeat scandal, is another. Recent media stories on child labour and slave wages in some supply chains, and questionable supplier management tactics by some supermarkets are examples of the added socio-economic challenges compelling organisations of all sorts to improve their Procurement capability.

A reference to UK supermarkets might seem strange in an article about fire and rescue management. However, a report by the think-tank Reform, published last year, suggested that the public sector services should in fact adopt the same type of thinking that has cut costs and improved quality in grocery retail, high street retail, supermarkets and even car manufacturing.

Procurement practitioners in the fire-fighting and rescue sector face broadly similar underlying issues as their colleagues in other sectors. In truth, majority of Procurement functions in most sectors today still struggle with achieving the success and recognition they crave. And Procurement is nowhere near as embedded in the fabric of most organisations as it should be.



Image courtesy of Sigi Osagie

Purchasing professionals in such functions are frustrated by the myriad of problems this brings – from regular squabbles with territorial stakeholders and budget-holders who don't recognise Procurement's role to disagreements with Finance colleagues who think "Procurement cost savings" is all smoke-and-mirrors.

Becoming More Effective

For fire and rescue Procurement leaders and staff, it appears the biggest frustration they face is the lack of appreciation of their value-add in their organisations, and, commonly, being 'denied' the opportunity to showcase their value-proposition. As one purchasing manager put it in a blog post, "Why should I have to constantly fight to be allowed to do my job?!"

Most purchasing people agree that what Procurement wants boils down to enhanced capability and better recognition across the wider organisation. Yet most efforts to enhance Procurement are not effectively focussed at these outcomes. It's no surprise that many Procurement departments end up going through transformation after transformation.

Procurement is About People

When you examine the challenges most Procurement functions struggle with they all relate to 'people' – whether it's territorial stakeholders; short-sighted or egotistical senior executives; or even the competencies, behavioural attitudes and thinking patterns of Procurement staff. These 'soft' issues are the root-causes of the problems that prevent most Procurement functions from firing on all cylinders.

Most efforts to enhance Procurement place overriding emphasis on improving processes and systems, with inadequate attention paid to people. Yet it is people that do the work and deliver results; not computers, strategies or processes – those things are simply tools or enablers we use to get the work done. So people matter most!

Our overriding focus on the tools and technical aspects of the purchasing work is the ball and chain holding Procurement departments back. When we expand our thinking to embrace the fact that organisations are about people, first and foremost, we create the ability to focus on what really matters for success on the job.



Image courtesy of Sigi Osagie

Procurement functions that achieve long-term success and kudos in the enterprise always give high priority to the human factors in the purchasing domain. Those functions still seeking their Procurement mojo must recognise that purchasing is a people-centric activity; they must place greater emphasis on the people-related factors – the soft issues – that underpin or hamper Procurement success. There are two aspects to this;

1. The Procurement organisation – Recognising the importance of the people inside Procurement who do the work, and taking the right steps to grow the function's talent or 'people capability'.
2. Stakeholder perceptions of Procurement – Making a greater effort to manage interactions and relationships with people outside the function, and building a credible 'Procurement brand' to connect with these folks better.

People Inside Procurement

An effective functional organisation is the bedrock of Procurement success, and people are the lifeblood of any organisation. But, sadly, many Procurement leaders invest inadequate time and energy on inspiring, engaging and developing their people. As uncomfortable as it might sound, this reflects a key failing; because the Procurement leader is the most critical person in the Procurement organisation.

Leadership is the glue that holds everything else together. So it is crucial that Procurement has an effective leader. An effective Procurement leader is not a 'purchasing geek' but a 'business leader', who is adept at aligning Procurement's efforts to the broader business priorities and cultivating relationships, especially at senior levels, to further Procurement's agenda. This is particularly crucial in the public sector where Procurement must operate under complex and sometimes conflicting priorities, and deal with a diverse range of stakeholders on safety-critical and risk related issues.

Most efforts to enhance Procurement place overriding emphasis on improving processes and systems, with inadequate attention paid to people. Yet it is people that do the work and deliver results.

Sigi Osagie is a leading expert on effectiveness in Procurement and Supply Chain Management. He helps organisations and individuals achieve enhanced performance growth to accomplish their goals. He is the author of the highly-acclaimed book *Procurement Mojo – Strengthening the Function and Raising Its Profile*.

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Procurement leaders must appreciate that building people capability means ensuring Procurement has the right calibre of individuals, who understand how their actions bolster the function's success and its reputation. This isn't about having a team with high technical expertise, such as category management or strategic sourcing. Rather it's about attitudes as well as aptitudes. Having sound technical knowledge is of limited value if you're unable to exploit that knowledge successfully because you're not organisationally savvy.

To educate stakeholders across the fire-fighting and rescue organisation and create alignment with the Procurement agenda you must be able to 'connect' with a range of personalities and win them over – you must have highly developed soft skills; competencies that enable you to navigate organisational dynamics with flair.

The most effective purchasing people are those with great soft skills – attributes like persuasive communication; self-leadership; influencing; results-orientation; and emotional intelligence. Think of technical purchasing skills as 'Qualifiers' – skills that simply qualify you to play in the purchasing sandpit; whereas soft skills are 'Order-winners', the key intrapersonal and interpersonal competences that enable you to win in the job. You can't possibly be a half-decent professional without the right technical skills. But to be effective and outclass your average peers you must have highly-developed soft skills.

Procurement people must be held accountable for their performance as well as their behaviours – because "performance" is not just about what we achieve; the behaviours and attitudes we exhibit are as important as what we achieve. This is particularly crucial considering the impact our behaviours have on stakeholders outside Procurement and their perceptions of our 'Procurement brand'.

People Outside Procurement

As difficult as it may be to accept, stakeholder perceptions and their consequent reactions are largely driven by our own attitudes and behaviours. Rather than waste energy on countless squabbles with these folks, it's far more effective to get to understand them better, and direct more effort at managing their perceptions, educating them and fostering progressive relationships. People are always more likely to buy in to your agenda if they like you or 'connect' with you as a person.

The more stakeholders feel that Procurement is meaningful to their challenges, the better Procurement's brand reputation.

The Procurement brand is the pinnacle of Procurement success; it reflects everything the function stands for. Procurement folks can employ certain tactics to propagate positive perceptions with people outside the function, including;

- Remember that people's attitudes, behaviours and decisions are not driven entirely by logic or reason. Emotions are always part of the mix, usually beneath the surface. So develop interpersonal savvy – make the effort to establish an emotional connection with your individual stakeholders; get to know them as fellow human beings like you.
- Get close to your internal customers to develop insights on what's truly important to them; focus on nurturing harmonious and productive relationships; and leverage persuasive communication to educate them on Procurement's value proposition beyond the traditional "cost savings".
- Utilise astute PR to continuously promote a positive image of Procurement, e.g., through stories on the intranet site, newsletters, periodic executive briefings; regular engagements with critical stakeholders to keep abreast of their worlds and provide updates on the Procurement agenda; etc.
- Remember, as a purchasing person YOU are a 'Procurement Ambassador'. So ensure that everything you say or do creates a positive perception of Procurement as a credible 'business partner' function in stakeholders' consciousness.

In summary, Procurement success demands functional effectiveness – doing the right things to get the desired functional outcomes. Often, the right things are not always the most popular actions. Yet if you examine instances of Procurement functions achieving their mojo – delivering sustainable success for the individual, the function and the enterprise – you will find the embodiment of the practices outlined above.

Organisations are about people, first and foremost. The more you master these people-centric or soft issues, the more you build pathways to sustainable success for your fire and rescue Procurement function.

For more information, go to www.sigiosagie.com

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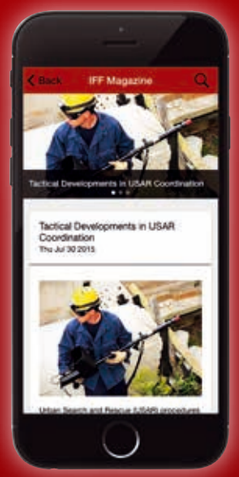
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