FIREPOINT

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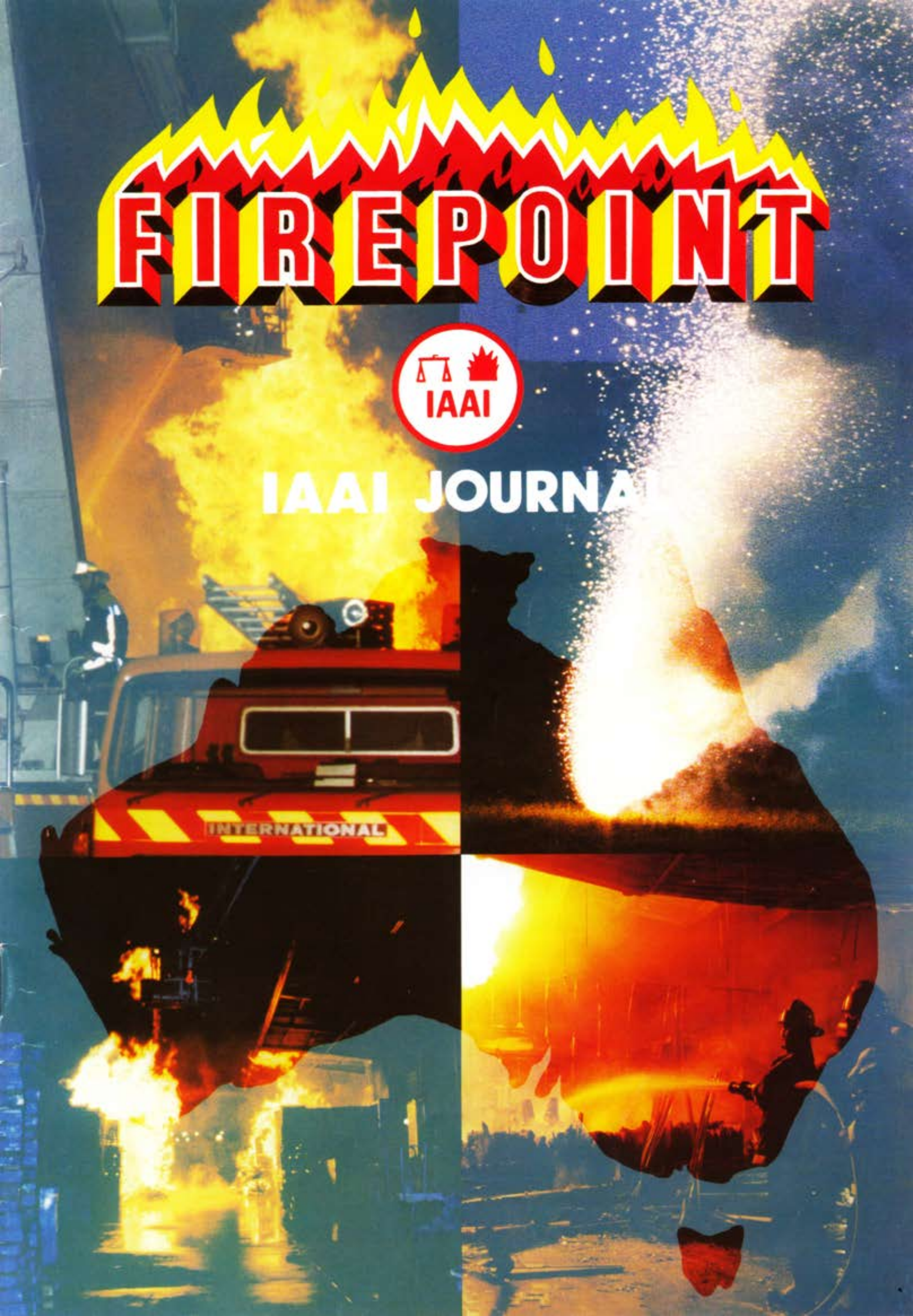

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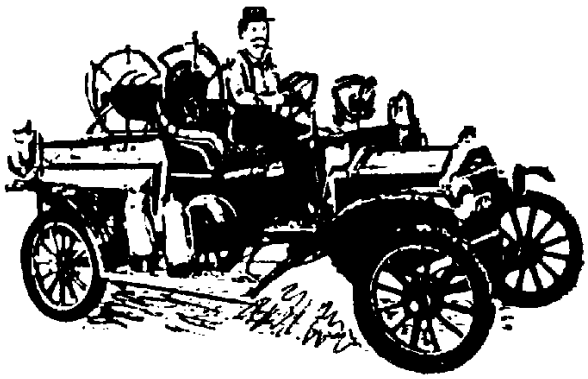
FIREPOINT: IF YOU HAVEN'T PAID YOUR FEES FOR THE CURRENT YEAR, PLEASE DO SO NOW.

EDITORIAL

In this issue members receive ample notice, and initial details, of the bi-annual Australasian Conference (AAFI) to be held in Melbourne in September next. Read the article and the flyer. Be sure to get on board for this mammoth event.

Wal Stern



CONTENTS

Vol. 22, No. 4, December 2011
Issue No. 88, ISSN 1035 2287

AAFI 2012 Conference 19 – 21 September 2012 Melbourne Australia
Fire Investigation in Australasia: The Way Forward

On behalf of the Victorian Association of Fire Investigators (Chapter 58 of IAAI) and the organising committee I invite you to the 2012 Australasian Associations of Fire Investigators Conference to be held in Melbourne. The aim of the conference is to promote best practice in fire investigation and continue to forge strong partnerships.

The conference is the peak bi-annual forum for fire investigators in Australasia. AAFI 2012 will attract experts and attendees not only from all over Australia but also from the United States of America, United Kingdom, Asia, UAE and New Zealand.

AAFI 2012 is an opportunity to showcase Australia's and the world's capabilities in the investigation of fires. It's a forum that brings together representatives involved in fire investigations from fire services, police services, and other regulatory agencies, private investigators, as well as those associated with analysis of the evidence gathered.

Additionally, those who use the evidence gathered for further actions, such as police prosecutions of criminal activities, or fire services or other regulatory agencies with prosecution provisions; criminal and civil legal representatives, loss adjustors, insurance firms, and governments for improvements in safety requirements.

The Conference provides an opportunity through networking to work together across a range of disciplines and jurisdictions to share experiences and the latest innovations and techniques to develop more effective fire investigation methodologies.

Keynote Speaker - Peter Mansi

Peter has been an operational fire officer within the London Fire Brigade for almost 28 years, the last ten of those as a Fire Investigator, Station Manager within the Fire Investigation Group.

In 2008 he took up post as the Borough Commander of the City of London, and under his command, the Fire Investigation Group at this new central location within the City of London.

He helped instigate the Arson Reduction Team, analysing and addressing the extensive problem of arson in London. To this end, he was instrumental in establishing Borough Arson Liaison Officers in each of the 33 boroughs within London, consisting of a police officer and a fire officer to focus on 'all things arson' within their respective boroughs.

He has supported the development of Forensic Arson Liaison Officers with Scotland Yard's SCUD within each of the borough teams.

Other confirmed speakers:

Dr Rebekah Doley – Arson Profiler, Director Clinical and Forensic Psychology Programs, Bond University
Peter Gallagher – Senior Station Officer, NZ Fire Service
Simon Langdon – Managing Director, Eye fi
Craig Lapsley – Victorian Fire Commisioner
Jim Munday – Managing Director, Munday Forensics

Topics covered during the conference include:

- Strategic directions in Arson Investigation
- Arson profiling & serial arson in Australia
- Interactive panel discussion
- Technological advances in investigations
- Recovery and restorations
- Legal issues
- Case Studies including:

  The fatal New Zealand fire at the Tamahere Cool Store.
- The latest courses relating to fire investigation available in New Zealand and Australia.
- And a number of other topics relating to conference theme.

Melbourne and The Sebel Albert Park

As the venue for AAFI 2012, the Sebel Albert Park, Melbourne provides a sense of space and comfort, with a number of the Conference rooms overlooking stunning Albert Park Lake or the sunsets over Port Phillip Bay. All creating a great environment for a high quality and enjoyable experience for AAFI 2012 attendees.

Social Program highlights

The conference will feature a Welcome Drinks, Partners Day and Conference Dinner to be held in a central Melbourne location.

More Information for attendance, sponsorship or expression of interest in speaking go to the Conference Website www.aafi2012.com.au or email info@aafi2012.com.au

Make your attendance at this bi-annual conference of Australasian fire investigators a must for 2012.

FIRE ON THE FREEWAY

Rick Miller
Authorised Fire Investigator
NSW Rural Fire Service

Abstract:

On the 29/08/2011 a small fire was reported to "000" as being beside the north bound lane of the F3 Freeway near Phone Box 601. A second caller gave the location as opposite Barnsley Public School. Three RFS tankers were responded due to the uncertainty about the fire's location.

A small fire was found and extinguished in the vicinity of the Cockle Creek Overpass. Fire fighters found a straight cut gear on the fire ground, removed this and placed it on the Armco railing. They did not connect the gear to a truck parked 130m away and with a Highway Patrol vehicle in attendance.

The area has a history of fires of incendiary origin and was investigated. The cause of the fire was determined as originating when a superheated gear from the truck left the vehicle and bounced/rolled to the north along the freeway before settling in scrub beside the roadway.

Cockle Creek originates in the Sugarloaf Range west of Newcastle, NSW. It flows under the F3 Freeway, south of Killingworth and then into the northern end of Lake Macquarie. The area has a recent history of incendiary fires and is a regular site for the burning of stolen vehicles. Fires in this area are routinely investigated by the Rural Fire Service.

The fire that occurred at 1331 hrs on the 29/08/2011 was difficult to find. Two callers, motorists on the Freeway, gave conflicting locations. When found it was quickly extinguished.

Being on the verge beside the road it was unusual for fires in the area. Most are accessed from bush tracks that run through land formerly part of coal mining operations or on land used for power easements. Fires beside the Freeway are often started by cigarettes or from motor vehicle accidents.

The fire was approximately 0.01 ha in size and located on an embankment covered by Casuarina saplings. It was extinguished using jets of water from the roadside and then mopped up by fire fighters climbing down through the fire ground.

In this process the area of fire origin was disturbed. A large straight cut gear approximately 21cm in diameter was found in the fire ground and placed on the Armco railing to mark the location of the fire. Sufficient fire indicators remained to establish that the fire originated in an area approximately 6m from the Armco rail and 9m from the traffic lane. The specific area of origin (SAO) was approximately 2m below the height of the roadway.

This location made a cigarette discarded from a vehicle an unlikely

cause. Most vehicles are travelling at the speed limit of 110km/ph in this area. Cigarettes tend to be pulled back onto the roadway and then flicked forward by passing traffic. If they lodge in the vegetation beside the roadway it is usually close to the road. There was no evidence of a cigarette in the SAO.

The fuel for the fire was leaf litter composed of Casuarina needles and Eucalyptus leaves. A discarded tyre, partly delaminated and a number of pieces of wood with the remains of barnacles added to the ground fuel. These appeared to have been there for some time.

The tyre had been dislodged and pushed out of the fire ground. Its position could be established and it was replaced. The partly delaminated tread had been ignited by the fire and this section of the tread faced the centre of the SAO. The crew leader of the first responding fire tanker indicated that this was also the area in which he found the gear.

This was straight cut and appeared to be either the first or reverse gear from a truck gear box. An examination of it showed that the ring of teeth normally engaged by the synchromesh and surrounding the hole for the shaft, had a bright orange colour. The gear had no coating of oil. The area surrounding the shaft had fracture lines consistent with metal from an adjacent gear being fused to it then having been separated by force. Concentric zones of colour were seen on the other side. A bright orange band near the shaft gave way to an orange /yellow colour.

These colour changes in the surface of the gear suggested that it had been exposed to extreme heat. The outer teeth of the gear showed damage consistent with being rolled/bounced on the concrete roadway.

Assisting Rick Miller with the investigation was Stuart Farley, Captain of Mandalong RFS Brigade, and a trainee Fire Investigator. Stuart happened to drive past the fire scene on the day of the fire. He noticed a truck parked in the breakdown lane approximately 130m to the South of the fire. A Highway Patrol vehicle was in attendance. The first responding fire fighters had made no connection between the truck and the fire. Given the evidence of the hot gear it was decided to investigate the scene where the truck had been parked.

A ball bearing was found on the other side approximately 30m to the South of the fire. It also appeared to have been subject to extreme heat and its surface was damaged in a manner consistent with being bounced on the roadway.

At the site where the truck was parked, the road surface was stained lightly by what appeared to be oil. The rectangular pattern was consistent with drips falling from parts of the chassis. Part of a linkage was found nearby.

Approximately 110m to the South and on the Cockle Creek Overpass, were the remains of a truck gear box. The drive shaft was a light grey colour; it had been bent and fractured. The helical gears that were still on the shaft had the same bright orange colour seen on the gear from the SAO.

Having matched the size and colouring of the gears at both sites, it was concluded that the gear from the SAO was likely to have been heated while part of the gearbox found beside the road.

In the absence of evidence for any other cause, it was suspected that the hot gear had ignited the leaf litter and tyre. To establish if this was possible a temperature chart for heated steel was consulted. There are several of these available on the internet and the colours are generally consistent between them. The chart provided by Smex at the internet site http://www.smex.net.au/Reference/SteelColours.htm is one of the most detailed. The orange colour was consistent with heating of the metal in the range of 840 to 950 ^{0}C and orange/yellow colour with a temperature between 950 and 1050 ^{0}C. The grey colour on the shaft of the gear box was consistent with temperatures in the range of 427 to 537 ^{0}C.

Tony Cafe at TC Forensics supplies information for investigators relating to ignition temperatures for various objects. Rubber ignites in the range of 260°-316° and wood at 190°-260°. Eucalyptus leaves ignite at temperatures less than these products.

If it had maintained it's heat while being rolled/bounced into position it was possible for the gear to ignite the fuel found in the SAO.

The gear found at the SAO was approximately 190m away from the position where the truck stopped and 300m from the remains of the gearbox. At 110km/ph, the Freeway speed limit, it would take approximately 6 seconds for the gear to travel to the SAO from the position where the truck stopped and 10 seconds from where the gear box was found. At 80km/ph the equivalent times are 8 and 13 seconds. This would be insufficient time for the gear to have cooled below the ignition temperature of the fuels at the fire scene. Damage seen on the teeth of the gear was consistent with it rolling/bouncing on a hard concrete surface.

To establish if the truck was the source of the gear box a call was made to the Highway Patrol Officer who attended the truck. He confirmed that it had stopped due to catastrophic failure of its gear box. The driver said that he had had the gear box serviced the day before. On the 29th he drove from Sydney and when passing over Cockle Creek he heard the gear box break apart and fall onto the roadway. He believes that the gear oil was not replaced after the service.

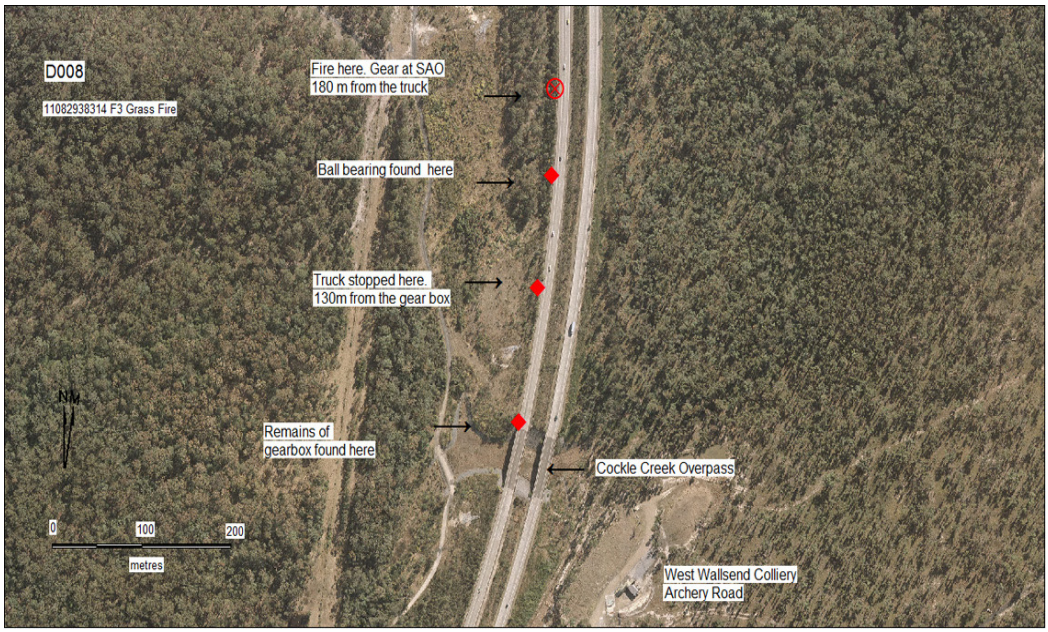
The driver and Highway Patrol Officer moved parts of the gear box from the driving lanes to the side of the Overpass. They were extremely hot.

The cause of the fire was determined to be from the accidental use of equipment. This finding was based on the observations made and lack of evidence for any other cause. A lack of oil in the gear box caused the truck's gears to heat and seize, throwing the straight cut gear onto the concrete of the roadway. It then rolled/bounced to the SAO where it ignited leaf litter and an abandoned tyre. The fire then advanced to the road verge where it was extinguished.

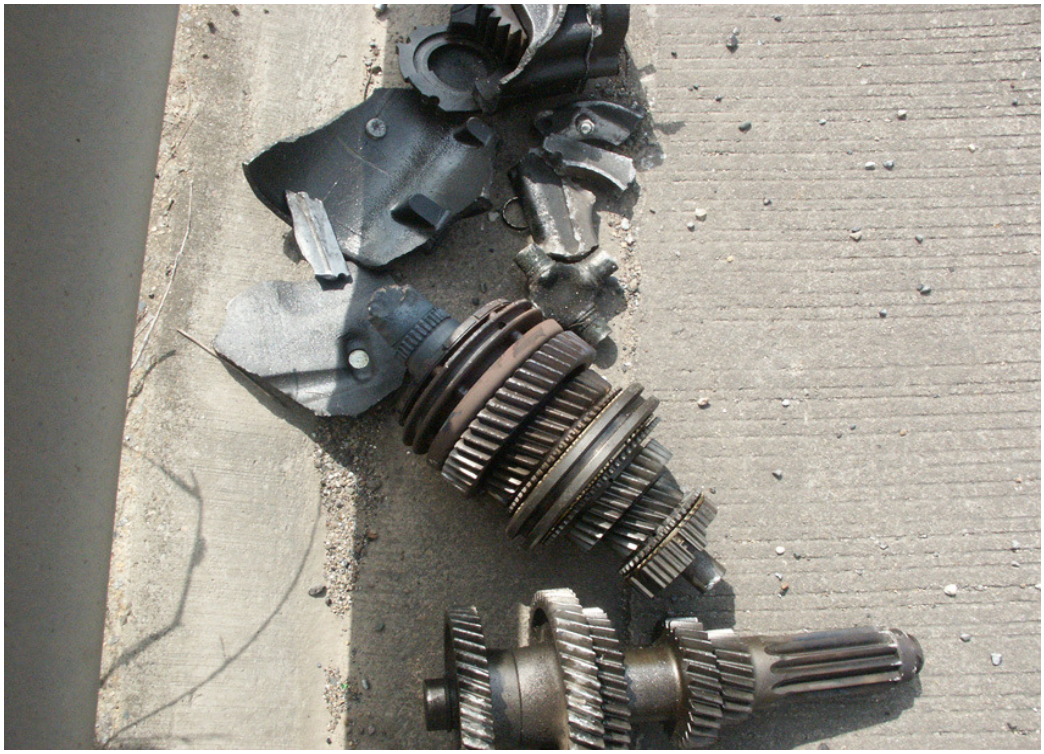
References.

Scale Model Exchange (SMEX). Colour Chart for the Approximate Temperature of Steel. Web at http://www.smex.net.au/Reference/SteelColours.htm.

TC Forensics. Tony Cafe. Physical Constants for Investigators. Web at http://www.tcforensic.com.au/docs/article10.html#1.1



The location of the gear and fire is marked in the top centre. A truck was seen to be parked approximately 190m to the south of the fire a Highway Patrol vehicle was in attendance. A rectangular oil stain was found at this site. The remains of a gear box were found approximately 120m to the South.



This collection of parts from a truck gear box was found on the Cockle creek overpass. The gears seen in the centre of the photograph have a fractured straight cut. The drive shaft in the top has also twisted and fractured. Its grey colour change suggests super heating. There are few traces of gear oil on the parts.

IS THIS TRUCK GEAR A COMPETENT IGNITION SOURCE OR JUST A LUMP OF METAL?

Rick Miller, Darin Howell and Jeff Compton. Authorised Fire Investigators, NSW Rural Fire Service.

Abstract:

A red hot truck gear was suspected of causing a roadside wildland fire. The gear was recovered from the scene and an experiment undertaken to confirm it was potentially a competent ignition source.The gear was heated with an oxy-acetylene torch. At the temperature the gear was estimated to have achieved at the time of the gearbox failure (450^{o}C), leaves similar to the fuel on the fireground were dropped onto the gear and they ignited. At a lower temperature (220^{o}C) leaves were not ignited. The authors believe this truck gear was conceivably a competent ignition source in this incident.

A roadside fire occurred in bush land (Miller, 2011). Investigation determined a specific area of origin. In that area a truck gear was found. This had apparently rolled into the bush from the destroyed gearbox of a truck driving on the road. This gear was suspected of causing the fire and there were no other potential ignition sources found. The hypothesis was that the gearbox had failed as the result of a lack of lubrication, leading to extreme heating whichresulted in distortion of the components, destroying the mechanism and ejecting red hot parts. The suspect gear had ignited the fine surface fuel(eucalypt leaves and twigs) by conduction and radiation of heat. The fire had spread into the bush and ignited a discarded tyre. An experiment was undertaken to see if the gear would be a competent ignition source.

For fire to occur the fuel needs to be raised to a temperature above its ignition temperature. The literaturereveals there may be a difference in ignition temperature if the temperature is achieved by an open flame (piloted ignition) or by radiation or convection (auto- ignition) or by conductionBabrauskas (2001). In truth little is known about the ignition of fuels in contact with hot objects.

Babrauskas (2001) also reports that the piloted ignition temperature of wood lies between 210^{o}C to 450^{o}C.Auto-ignition temperatures (as occur in a furnace, vary from 200^{o}C to 500^{o}C). Little is known about the ignition temperature of leaves. Smith and his colleagues (2004) have determined the piloted ignition temperatures of leaves of some Californian plant species. They found the temperatures to range between 319^{o}C and 346^{o}C, although the value they determined for paper (339^{o}C) is somewhat higher than that quoted by other sources (e.g.Cafe (2007); 218^{o}C to 246^{o}C – 2007).

That fire can result when fuel contacts a hot object is well reported (e.g.Koseki and Tamura, 1998). In the wildland setting, particularly in grasslands,fires have been caused by contact of grass with hot

automobile exhaust system components (Bertagna, 1997).

In this case, the essential question is can the hot object (the heated truck gear) transfer enough heat to the first ignited fuel (the fine surface fuels comprising eucalyptus leaves and twigs) to raise its temperature above its ignition temperature.

Examination of the gear recovered from the fireground revealed it to be about 21 cm in diameter and 3.5 cm in thickness. It has an8 cm diameter opening for a shaft and pyramidal teeth surrounding the shaft aperture for synchronisation. It weighs 4.75 kg. Examination of the face adjacent to the shaft aperture revealed the metal to be deformed (see figure 1). A number of mechanics were consulted and it was felt that the gear had been damaged by heat and that the degree of damagereflected heating to red-heat, approximating 450^{o}C.

Methodology.

The authors performed anexperiment designed to reproduce the conditions of the fire. The gear was heated using an oxy-acetylene heating torch until it was red hot in parts; with the temperature confirmed by pyrometer to be in the range of 450^{o}C. A period of time consistent with the time taken for the gear to roll into the bush (13 secs; see Miller 2011) and then a sample of leaves and twigs was dropped onto the gear. These leaves had been chosen as similar to those at the fireground. As moisture is known to contribute to the ease of ignition (Creagh 2008) they had a similar moisture content of 20%.

They were observed for signs of ignition.

The gear was allowed to cool until the pyrometer reading was220^{o}C. More leaves were added and further observations made.

The experiment was documented by photographs and video.

Results.

The leaves added at 420^{o}C (the temperature the gear had fallen to in the waiting period) immediately began smouldering and emitting increasingamounts of grey smoke. Within 16 seconds some leaves were glowing and by 45 seconds there was flaming combustion. The leaves in closest contact with the metal ignited first.

The leaves added at 220^{o}C smouldered, gave off smoke and charred but there was no glowing or flaming ignition.

Conclusions.

The apparent ease with which the truck gear was able to ignite a sample of representative fine surface fuels, at a similar temperature to that which examination of the gear suggested it had reached when the gearbox failed, led the authors to believe it could, in this case, conceivably be a competent source of ignition.

The fact that it was unable to ignite leaves at a lower temperature, but one within the range of ignition temperatures for wood, is further evidence that the relationship between hot object temperatures and the ignition of fuels is not clear cut.

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Figure 1. Gear recovered from the specific area of origin of a roadside fireground

N.S.W. Association of Fire Investigators Inc.
(International Association of Arson Investigators (Chapter 47))

President's Message

Welcome everyone to the final report for 2011. This has been an incredible year for disasters and grief all around the world. I just hope that 2012 is a much better year.

I would like to personally thank the committee members of NSW, both new and old, for making themselves available to keep our association running, and running strong it is.

Our education nights are well received and if you have any ideas or topics for speakers for the future, please let us know.

Our Christmas education night on the 1st December also includes a dinner which, for a small fee, should be a great night. We will be having 3 speakers on incidents which have occurred and the subsequent investigations.

The 2012 Australasian conference in Melbourne is going great guns with speakers and sponsorship, and don't forget to keep free the 19th to 21st September 2012 for a great conference.

On behalf on the NSW Association of Fire Investigators Inc committee, we wish everyone a very safe and prosperous Christmas, and hope that we don't have to work too hard.

See you next year at one of our education nights.

Mark Black
President

UK Product Recall Database

A Product Recalls section has was added to the IAAI-UK website in 2010. It allows the fire investigation community and public to search a database of almost 400 UK product recalls dating back to 1985. One feature that was designed specifically for fire investigators is the "View all product recalls available". This feature will list the product type, manufacturer and recall date for every Product Recall on the database in a long list. It is then possible to sort the list by either of the column headings (product type or manufacturer or recall date). To view the most recently added Product Recalls sort the list by "date" and they will be displayed at the top of the list. The link to the new section is:

http://www.iaai-uk-productrecall.org.uk/recalls/search.asp

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Queensland Report

The QAFI held their Transportation fire seminar in September. The event was well attended by members who gained valuable insight into examination of fires in vehicles from excellent presenters throughout the morning. The afternoon was spent on the live fire site watching fire development in a caravan and in motor car. There were pre-burnt cars for members to test their skills and determine the origin of the fire (and video of the actual burns replayed at the end of the day so members could verify their findings). Additionally a display of vehicle burns and smoke release that are used in analysis of fire safety in tunnels was given. Thanks to all presenters for their time and expertise and also thanks to QFRS for their facilities and assistance during the day.

The 2011 Committee have determined the next function for QAFI will be at the annual general meeting to be held on Thursday 1 March 2012.

I would like to thank the QAFI committee for their efforts during the year and also thanks to **Forensic Services Australia** for providing meeting room facilities for the committee).

Also, thanks to **SAA Approvals** for again sponsoring QAFI for 2011.

Brian Richardson
President QAFI

THE UBIQUITOUS CEILING EXHAUST FAN – A NOTABLE FIRE STARTER

Russell F Lee FIEAust CPEng
Forensic Engineer & Fire Scene Examiner

They are everywhere; literally millions and millions of them. Nearly every home has one, and many homes have more than one. They sit in ceilings and walls, usually in kitchens, toilets and bathrooms. Some are wired independently. Some are wired with the associated compartment light fitting. They are invariably plug-connected so that lay-people can replace them easily.

They are usually fairly quiet and sometimes almost silent. They encounter steam, body powder, cooking fats, dust, fluff, and other contaminants in varying quantities and combinations. They are often left running for protracted periods, and are often incorrectly installed or indeed selected.

Their very simplicity and ease of use often leads to abuse either from ignorance or forgetfulness. They have a finite life but are run close to destruction before replacement, usually signalled by unacceptable noise; the only criteria available to most people. For the most part they run reliably for many years of good service. Every now and then, they are involved as an ignition source for a fire, most of which are catastrophic. To mimic a famous physicist – "Why is this so?"

Construction

For the most part ceiling exhaust fans are constructed of a moulded thermoplastic body which is inserted into a precut hole in the ceiling or wall or a compartment and which is fixed in position by movable screw-fastened clamps. Some metal bodied fans are seen but they are generally unusual in the context under discussion. It is the plastic bodied machines which are of interest here.

The plastic body supports a shaded pole, single phase motor which is fastened into position by bolts which engage directly between the plastic support arms moulded as part of the body and the laminated iron core of the motor. Thus some of the heat of operation of the motor in normal or abnormal service is transmitted to the plastic supports, and accelerated ageing and embrittlement of the plastic can occur with a loss of structural integrity.

The same bolts also secure and hold in position the rotor bearing housings. Any looseness in the fastening of the bolts tends to affect the bearing positions and thus the air gap between rotor and stator. Plastic fan blades moulded onto a plastic boss are fastened by spring clamp to the motor shaft. The boss is usually of a size which effectively occludes much of the direct air flow across the motor windings.

Recall that most of the work of an axial fan is done at the blade tips and not at the or near the boss. A decorative grille is presented to the occupied space.

The rotor bearings are usually of the sintered type, relying on imbedded lubricants for reliable operation. Such bearings are suitable for intermittent or short term use only, and are not intended for prolonged or continuous use. Furthermore some fan manufacturers point out that fans with sintered bearings are suitable only for vertical rotor shaft orientation.

Continuous and prolonged operation, and horizontal rotor shaft orientation usually requires a different bearing structure using sealed for life ball bearings. The packaging may make this distinction but enquiry to the manufacturer exposes the recommendation. Incorrect selection or prolonged continuous operation under adverse conditions such as steam or dust laden air can lead to bearing wear which causes a condition where the motor may not successfully accelerate to full speed. What cooling is available from air flow is thus reduced.

The motors are effectively impedance limited and there lies the rub. Ceiling exhaust fans in the range between 150mm and 350mm diameter typically draw about 0.35 Amperes at full load, and about 0.39 Amperes or 90 Watts at stall. That is there is little difference between normal and abnormal current.

Some years ago a few manufacturers attempted to insert effective thermal protection for the windings but they were generally unsuccessful. Some attempts have been made to install thermal “one shot” fuses as a safety measure but apparently that has not proved successful. The motors are connected across a single phase supply, usually a lighting circuit, with only the general circuit protection in play. A two wire connection without earth wire is typically made.

Indeed given the “double insulated” nature of plastic bodied fans no earth connection is provided and residual current devices are not effective in monitoring these machines. It is only in the case of metal bodied motors or metal encased fans that earth connections are seen. The scene is therefore set for a significant and generally long term heat source to be put into operation in a ceiling or wall space without any reliable or effective over-temperature monitoring.

The motor windings are contained in one coil usually encased these days within a moulded plastic enclosure of flame retardant composition. Until recent years, paper or plastic tape wrapping of windings was the norm, and it is still common to see motors which are wrapped with these materials. Both forms of enclosure are affected by heat; the former by driving off the plasticisers such that embrittlement can occur, the latter by accelerated ageing and embrittlement.

The effect is to markedly reduce the flame retardant characteristics of the enclosures, bearing mind that over time the flame retardant chemicals are driven off by heat just as are the plasticisers.

The Failure Mechanism

There are two common failure mechanisms. Both are based upon prolonged heat attack and upon the stalled or close-to-stalled condition. It is most unusual to see a mechanical or electrical failure in which heat is not a major factor, or in which a manufacturing defect is implicated.

Given time, a heat load of about 90 Watts is more than enough to precipitate degradation and ignition. Recall that the equally ubiquitous low voltage downlight is rated at about 50 Watts. Recall also that temperature is not the only issue involved in ignition. Energy density, time, the rate of energy transfer, and the ability to safely liberate heat are also important factors.

Any condition which reduces the cooling across the motor windings, already significantly reduced by the general design but allowed for in most cases by the manufacturer, can be expected to induce accelerated ageing of motor winding insulation. Under a stall condition, cooling is effectively reduced to incipient radiation or conduction into other materials.

Interviews with owners affected by fan fires show that about one to three weeks operation in a stalled condition is sufficient in some cases to produce a failure of the motor windings. This effect seems to be a common factor even though the fan may have operated for many years or only for a relatively short period. Not all stall conditions result in a fire. Whether or not an ignition occurs depends on many factors, including the orientation of the fan, the degree of contamination, the age of the fan installation, and its use history. The incidence of fire appears to be higher with paper-wrapped windings, than with plastic-encased windings.

In a decision similar to that which precipitated the present ceiling insulation fiasco, the Federal government recently ordered that incandescent GLS lamps be replaced by compact fluorescent lamps. Evidence is available showing that harmonic resonance between ceiling fan motors and CFLs on the same circuit is occurring, particularly and noticeably during coincident motor and lamp starting. The long term implications for possible ignition effects are not yet apparent.

The first failure mechanism involves the condition of continuous operation such that significant quantities of heat are delivered from the motor stator iron into the plastic supports holding the motor and fan in place inside the housing. Gradual embrittlement of the plastic may occur and if the condition persists the plastic can fracture, dropping the fan onto the decorative grille or housing such that a stall occurs.

The second failure mechanism then comes into play. It is remarkable how many owners operate the fans continuously, either because they leave the associated light on continuously or because the fan noise is either so low or in the general background noise level as to be unnoticeable. Owners of fire-affected houses will insist that the fan was off but an examination of the associated light or fan switch shows it was left on. This is particularly so of those

installations where the fan is separately switched but the switch is on the same switchplate as the light. Accidental manipulation occurs.

The second failure mechanism is from overheating and failure of the motor windings due to an induced stall other than as discussed above. The stall may be induced by a failure or partial failure of the bearings but this is unusual. The usual precipitating conditions are…

- Thermal insulation is introduced into the ceiling cavity without proper control and the body of the fan housing is filled such that the blades cannot rotate. The event usually occurs a few weeks after the insulation is installed.

  Despite an Australian Standard detailing how thermal insulation is to be applied, the condition continues to be detected. And it is not just the latest fiasco people have to deal with. This form of abuse often causes melting and deformation of the thermoplastic supports of the fan motor so that it settles onto the decorative grille in a fashion similar to the first failure mechanism.

- Modern houses are constructed with ridges and valleys in tiled roofs which are often not grouted. Thus strong winds can enter more readily into the roof space and may shift loose thermal insulation into the fan housing possibly causing a stall.

- Owners or workers entering the roof space disturb the thermal insulation or other materials (families store all sorts of things in roof cavities) so that it falls into the fan housing and causes a stall.

- Birds and vermin disturb the thermal insulation or introduce nesting material so that it falls into the fan housing and causes a stall usually at start.

- The electrical cable connecting to the fan motor is extended across one of the motor supports and is tied to one of the fan support arms. Failure or removal of the tie sometimes permits the cable to descend into the fan swept path, thereby inducing a stall usually at start.

- Sometimes when there is a change of ownership, the new owners are unaware that an electrical fan is installed. They may think it is just a ventilation grille because the fan is already stalled and does not make a noise. They sometimes do not know where the switch is. They may also hear no fan operation sound when they manipulate the suspect switch because the fan is already stalled, a condition which the former owners probably were aware of but had taken no action to fix.

Failure of the Motor Windings and Ignition

Overheating of the motor windings due to a lack of cooling appears to be the failure mode. The alternative is poor manufacture or poor wiring insulation coating, but this appears to be rare. Examination of ceiling exhaust fans at fire scenes where the

fan is not involved, often presents evidence of prolonged (not fire-related) overheating with discolouration of the plastic winding casing or the paper or sometimes insulation tape wrappings. For those fans which are implicated as the ignition source, failure is characterised by one or both of two observations. They are…

- A deep-seated degradation and darkening of the motor winding wire insulation, usually quite distinctive from the heat effects of the ensuing fire.

- A series of electric arc melts on the winding wires following a loss of insulation integrity. These melts may be distributed across the surface layers of the windings or may be more deep-seated.

  For motor winding failure inducing a fire, the arc melts are usually discovered on the upper surface of the windings. For an occupied space fire inducing winding damage, the arc melts are usually found on the lower surface of the windings. The arc melts are the ignition factor for the winding casing or wrappings.

Bearing in mind that the motor current is impedance limited, loss of winding wire length due to the short circuits reduces the circuit impedance and increases the current. The overheating thus is likely to accelerate.

Usually a short circuit is also notable on the connecting cable close to the fan motor termination, thereby showing that the winding faults were insufficient to operate the upstream circuit protection, and the circuit remained energised until such time as the connecting cable was attacked and the circuit protection operated.

Given the overall numbers of ceiling exhaust fans in service, the incidence of associated fire ignition is low. For the most part manufacturers appears to have made concerted efforts to reduce the risk of ignition.

Whilst the quality of the fan design and manufacture is an issue of interest, experience suggests that the salient factor is abuse of varying sorts leading to a stall condition and overheating.

In the presence of combustible contaminants such as cooking oils and greases, fluff and nesting materials, propagation of the fire from the fan is promoted.

Although the typical result of a fan fire is for the grille and body of the fan to either fall to the floor or to hand from its cable, there is sufficient fuel in the plastic body and blades to create a significant flame and plume in the roof or ceiling space.

People should be encouraged to check and clean these small exhaust fans on a regular basis. They seem happy to clean the fan grilles because they are visible, but it is rare to see motors and fan blades clean. Regarding the underlying issue, perhaps one day an effective thermal cutout will be fitted to fan motors.

Victorian Association of Fire Investigators Inc. Including Tasmania (VAFI

Website www.vicfire.com

Progress with the arrangements for the National Conference 2012 in Melbourne is still accelerating. Calls for papers will soon be announced. The Committee has some overseas and other speakers in the pipeline but is anxious to hear from the membership in general.

Your experiences and opinions are important to other members. Even if you have no experience in giving a presentation, the Committee is there to help you to prepare. Think about it. Remember we train each other.

On 9 September 20, VAFI held its Annual Field Day at the Huntly Training Grounds (near Bendigo) of the Country Fire Authority. The VAFI Annual General Meeting and Election of Officers was held on the day.

The event was well-attended by about 97 members, including those from Country Fire Authority, Metropolitan Fire and Emergency Services Board, Victoria Police Arson and Explosions Squad, Victorian Forensic Science Centre, Energy Safe Victoria and the Department of Sustainability and Environment (DSE).

Lecturers included members, and outside specialists from the Victorian Caravan Parks Association and the Recreational Vehicle Manufacturers Association of Australia. Two owners availed themselves of the means to get rid of an unwanted caravan, and we appreciate their generosity. The themes of the day were "Fires in Caravans" and "Clandestine Laboratories". Lectures, including a case study in the Training Room were supported by two live burns of caravans.

Fires in Caravans

The caravan burns were arranged with typical contents found in caravans so that a practical fire load was available. One burn was well-ventilated and the other burn was partially throttled. Thermocouples were placed so that the development of the hot gas inside the vans could be tracked, and the accelerating nature of the hot gas layer development was apparent.

Both burns were halted during the early development stage so that members were able to inspect the interiors and to see the development of the origin of fire. The vans were then burnt to destruction.

Part of the lecture program included advice on the construction of old and new style caravans, and this information was useful in assessing the rate of burn and the extent of damage. The effects of wind on the fire development and the resulting biased burn patterns were clearly seen.

Clandestine Laboratories

The lectures and discussions on clandestine laboratories drew detailed questions and discussions, as to the means of recognising such installations, and the hazards of working on such fire scenes were canvassed. The lectures were supported by Power Point presentations.

Once again VAFI thanks the CFA staff at Huntly for their assistance and advice.

VAFI Scholarship

There has been no VAFI scholarship awarded for 2010/11. Remember that each year up to $1000 is available for studies in fire investigation. All members are eligible to apply for 2011/12. The Committee hopes to hear from you. The details are on the website.

Other Matters

If you think you have a topic which would be of interest to the membership, do not hesitate to contact the Committee. A speaker could be arranged if you do not wish to speak yourself but you might wish to speak yourself. If you require assistance with such a presentation, the Committee can help.

The Australian Biennial Conference is to be run by VAFI on 19-20 September 2012 at the Sebel Townhouse, Albert Park.

The theme is "Fire Investigation in Australia – The Way Forward". You will need to get in early with your booking. Look on the website for further details, and watch for flyers next year. The Conference is being designed to be different in its presentation format, and the Committee looks forward to your support and interest.

For those who are interested, VAFI membership has risen to 258 fully paid members, including overseas. This is a record for us, and the Committee believes the number of members is related to the quality and content of the seminars, field days and information evenings that are presented. But it is not only that. It is the interest shown by you as the members.

Having to limit attendance numbers is encouraging to those presenting, but it is unfortunate that more cannot be accommodated at present. The Committee is examining ways and means of getting the information out to more members, with less need to travel long distances. Huntly is an example, as are recent lectures in country cities.

If there is a topic you would like to hear discussed, please write to the Committee care of the Secretary (see the web site). Your ideas are important. Remember, we train each other.