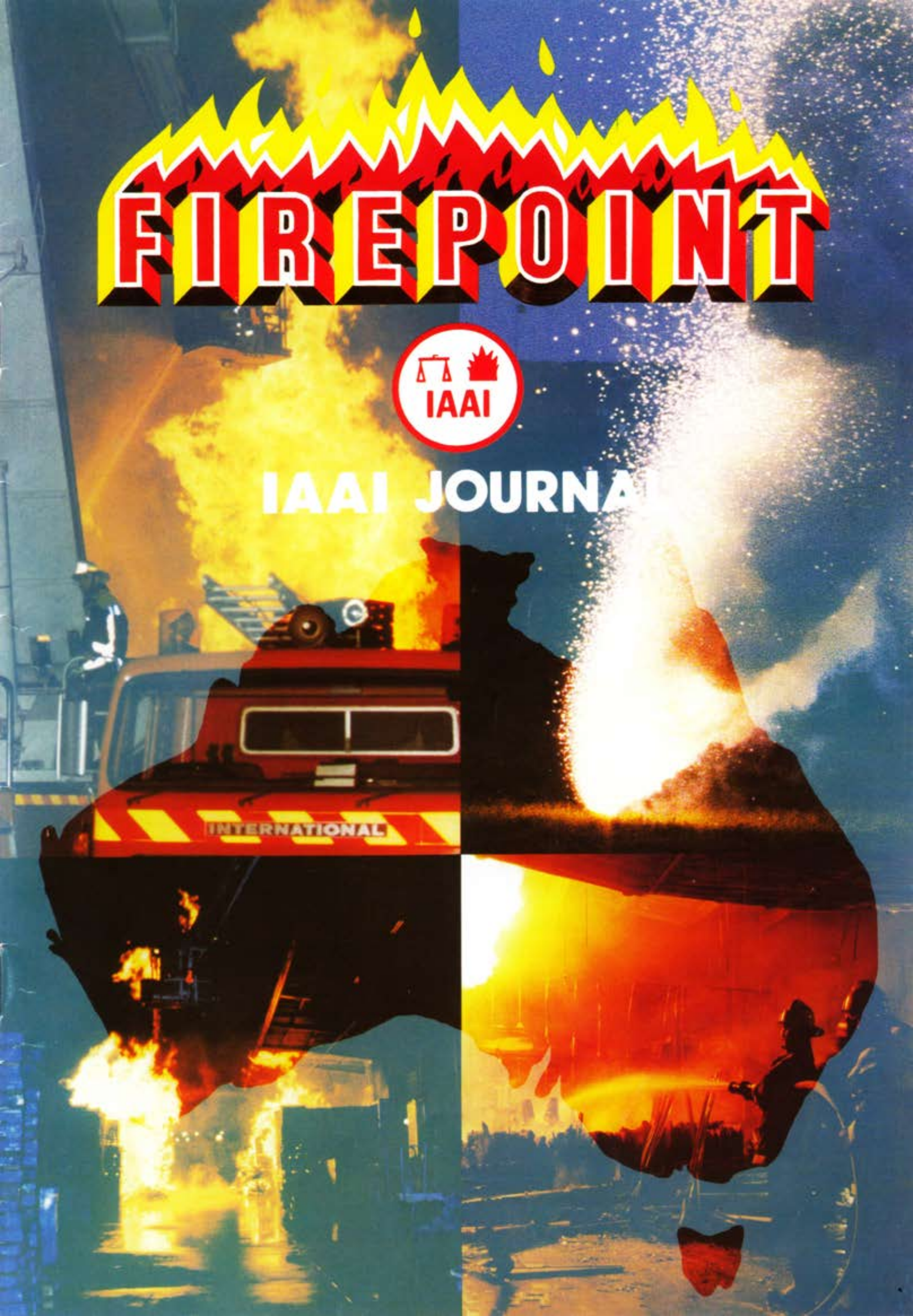


# FIREPOINT



IAAI JOURNAL



# Firepoint

IAAI OUTSTANDING PUBLICATION

AWARD WINNER FOR 2001/2002

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**FIREPOINT:    INTERNATIONAL WINNER OF THE IAAI**  
**2001/2002 AWARD FOR THE OUTSTANDING PUBLICATION**  
**OF A CHAPTER NEWSLETTER OR MAGAZINE.**

**EDITORIAL**

The bushfire season is with us again, and early indications are that it will be a trying time. It is not made easier by the commonly held view that many of the fires have been deliberately lit.

In Bali, members of the Australian Federal police have been struggling with the tragedy there.

It is a difficult time.

I hope all of you will get to have some time for relaxation over the holiday period, and there is no repetition of the events in New South Wales last year, when a number of members were called out to the fires, just as they were celebrating Christmas.

A happy holiday to you all.

*Wal Stern*



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## NSW ASSOCIATION OF FIRE INVESTIGATORS INC

(IAAI CHAPTER No.47)

ABN 91 718 947 405

P.O. Box 6129

BAULKHAM HILLS

BUSINESS CENTRE 2153

*"Providing Fire Investigation Education...the Path to Prevention"*

**President:** Richard Woods

**Secretary:** Norman Hewins

### Presidents Report

The events of recent times involving the bomb blast in Bali and the onset of major bushfires across NSW, highlights that our Association has a key role in ensuring that people within the fire investigation industry are provided with up to date information and education relating to our changing times. The events in Bali now provide us with a challenge to look at the educational side of fire investigation and post bomb blast analysis.

Clearly, the major tragedy that has unfolded in Bali is identifying that these events are coming closer to home and that a challenge exists for our Association to give training and education to personnel who may find themselves facing the examination of a scene of this nature.

The Bali investigations directly affected our Association, when our one-day Seminar in Canberra was to involve members of the Australian Federal Police's Forensic Services Unit.

Unfortunately at the last minute, all of these members who were

scheduled to attend were posted to Bali to partake in the major investigation now unfolding. It was recognised by several members at the Seminar that the events in Bali require specialist investigative skills and the Association needs to consider providing speakers on these topics in the future.

I believe the Association needs to adjust its education and training outlook to meet these new challenges in the future.

The one-day seminar in Canberra held recently was based on the theme *"Aspects of Fire Cause Determination"*.

It was hosted by our members from the ACT Fire Brigade. It was a great success and was enjoyed by approximately 60 attendees. On behalf of the Committee I would like to express my appreciation for the efforts of Wayne Shaw, Ian Brandreth, Kel Hannon, Keith Chavasse, Tony Ross, Peter Cartwright and the ACT Fire Brigade for making the day a complete success.

Thanks also to Ross Brogan who performed the role of MC keeping the program on time through the day. With minimal assistance they proved that the Association was expanding through another successful Seminar. Well done to all involved in what is likely to become a regular feature of our Seminar calendar.

Our Committee is now working hard to finalise arrangements for our 2-day Seminar to be held in Sydney on August 7<sup>th</sup> & 8<sup>th</sup> 2003. This is shaping up to be a major event with a number of international speakers already confirmed along with a venue in the heart of Sydney. Please keep these dates set aside for this major event.

With the festive season approaching I would like to wish all members a happy and peaceful Christmas and a prosperous New Year and look forward to our Association continuing to achieve every success in 2003.

Yours Sincerely,

Richard Woods  
**PRESIDENT**

# VICTORIAN NEWS

## Merchandising

The chapter committee has designed and purchased several unique items for members to purchase including:

Polo Shirts ( Navy Blue or White)  
@ \$25.00 ( have all sizes)  
VAFI Badges @ \$5.00  
VAFI Caps @ \$12.00  
Letter Openers @ \$8.00  
Coasters @ \$5.00  
Medallions @ 10.00  
Key Rings – Leather @ \$4.00  
Plastic @ \$2.00

You can get these items now.



All the merchandise is available, can be ordered via the Committee, and will be on sale at Training Sessions.

**Website** [www.vafi.org](http://www.vafi.org)

Remember this is your website and any comments or suggests would be appreciated and can be forwarded via the website. Construction of the links and information will be undertaken in the near future. Don't forget to look up the other chapter websites as listed in Firepoint.



## TENTH ANNUAL GENERAL MEETING

The Chapter's Tenth AGM was held on the Friday 13<sup>th</sup> September 2002 at the MFESB Training College in Abbotsford. There was 40 members attended and the new committee was elected for the 2002/2003 period being

President	Alex Conway
Vice President	Brian Neal
Treasurer	Bob Hetherington
Secretary	Trevor Pillinger
Committee	George Cooney
	John Kelleher
	Noel Desair
	Nicole Harvey

Tony Mandarano  
Scott Staunton (Legal Officer)  
John Lording

The President's report thanked the committee for their efforts during a busy year. In summary some of the points

Alex highlighted the introduction of the VAFI Website, 8 Committee meetings, financial membership 2001/2002 to 207 members, 4 training sessions including the successful major training at CFA Fiskville with explosives, the design and purchase of corporate

merchandising, the issue of new VAFI certificates to all members and finally the Major Seminar in October. He also thanked the MFESB, CFA, Police Arson Squad, VSFC, National Investigation Training Services and the insurance industry for their support.

The Chapter also supports the Royal Children's Hospital, Accident Prevention Centre and the IAAI through sponsorship of the Australian Rep and donations to the funds.

It should also be noted that Alex was awarded the Australian Fire Service Medal (AFSM) during the year, which shows his dedication and enthusiasm he displays not only for the Chapter and also in his career with the MFESB - FIA.

Following the meeting there was a presentation on the Westgate Coolstore Fire which was a fifth alarm fire with a \$60M loss and left 700 unemployed. The presentation included the investigation, post incident analysis and recommendations from the analysis. The feedback for all parties involved was also discussed. Our thanks to both Alex Conway and Peter Wright for this presentation.

### **Seminar ARSON – WHO? HOW? WHY? Held 24<sup>th</sup>&25<sup>th</sup> October 2002**

Although there was a late change to the venue, the Seminar was a great success for those who attended. Special. Thanks to the Australian Institute of Public Safety for our venue at Flinders Street in Melbourne.

On first day following the opening, Ms Rebekah Doley presented the secret life of arsonists, giving the profile and statistics of arsonists. Paul Millett from

the Victoria Police presented a case on serial arsonists showing a different view of the arsonist.



### **Keynote Speaker Rebekah Doley**

A presentation on botanical and photographic evidence showed the current and future techniques and processes being used at the Victorian Forensic Services Centre. The day was completed by a talk on scene safety by Steve Walkley from TFS.

The second day started with Rebekah Doley giving two presentations on the firefighter arsonist and pyromania which provided some interesting facts and figures. One was how firefighters should be assessed before they become firefighters. A quick change in program saw Steve Walkley present an entertaining session on fatal fire investigations with his graphic pictures.

The Seminar was completed with three entertaining presentations on Victoria case histories of arsonists.

The committee wish to thank all the presenters and especially our keynote speaker Rebekah Doley for the effort and quality of their presentations. Also thanks to our major sponsor CGU Insurance for their support.

In spite of a late change in venue and some advertised presenters being not available, the Chapter Committee was able to present an interesting and entertaining seminar, passing

invaluable information to those who attended.



**The venue AIPS classroom**



**Lunchtime feast**



**Committee members George Cooney,  
John Lording and President Alex Conway**

## **Membership**

Membership fees should have been paid for 2002/2003 and a review of membership will be undertaken over the new year break. If you haven't paid fees please contact Bob Hetherington on 0418 321 993 or Brian Neal on 0409 197 913 to confirm your membership status.

Welcome to new members Norman Jackson, Marita Williams, Roy Lee, Ian Hunter, Stuart Broad and Bill Johnston. As you can see the membership is still increasing, but it is important that all members still encourage any appropriate persons to join.

### Welcome

*By: Michael Holohan*

Welcome to the last edition of the Firepoint for 2002. We trust that you are enjoying our new format.

In this report we wish to announce confirmation of our forthcoming Major Project/Conference to be held on the 28<sup>th</sup> and 29<sup>th</sup> March 2003 at Royal on the Park, Brisbane.

Our August meeting featured Gary Nash of Forensic Services Australia. Gary was the recipient of the 2002 IAAI Educational Foundation Train the Trainer Grant and was fortunate to attend the 2002 IAAI Annual General Meeting in Milwaukee, Wisconsin. Gary shared his experiences with us, together with a number of photographs of the Grand Canyon. Gary also updated us on the CFI program and its implications on practitioners within Australia.

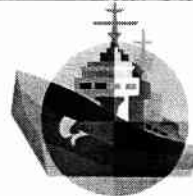
Just a reminder that all members are welcome to contact committee members and participate in the various sub-committees.

On behalf of the QAFI Executive Committee, we wish members and their families a very Merry Christmas and a Happy New Year.

### 2003 Major Project /Conference 2003

The QAFI is committed to providing training for its members, training which is both relevant and useful. Planning is well underway for next years Major Project to be held in Brisbane on **28 & 29 March 2003**.

The organising committee are not the only ones excited about the project. The project with a maritime theme (something which has never been done before) has generated quite a deal of interest not only in the fire investigation industry but also other industries.



The conference is to be held at the Royal on the Park in Brisbane and will cover many topics including fire investigation, risk management, fire protection, emergency response, environmental issues and design.

The program will be of interest to fire investigators, insurance personnel, maritime specialists, risk managers, emergency services personnel and other relevant government departments. It promises to be a first class event.

Delegates will be shown through the H.M.A.S. Diamantina which is a River Class Frigate located in the dry dock at South Brisbane. Diamantina was used in the Second World War mainly as an anti-submarine vessel. Tours will be conducted of the Diamantina with a focus on fire response & investigation. Delegates will also have the opportunity to look through the Queensland Maritime Museum.

The organising committee plans a different format to past events with opportunities for networking and fellowship. The conference dinner to be held on the Friday night (at the Royal) promises to be a night not to be missed.

QAFI Major Project 2003 is sure to be an exciting and challenging program. So, please mark 28 & 29 March 2003 in your diaries.

If you have any suggestions for the conference including topics or guest speakers, please contact conference organiser **Kate Ridgway** (O'Shea Corser & Wadley Lawyers) on **3222 4635**. Alternatively, if you would like to assist in organising the event, please let Kate know. We would like to have you on board.

### VAFI Conference

The Victorian Association of Fire Investigators (Incorporating Tasmania)

recently hosted its biannual conference entitled ARSON: WHO? HOW? WHY?

The Conference was held in Melbourne on 24 & 25 October. Over 70 delegates attended the conference from Victoria, South Australia, Western Australia, Queensland and Tasmania. QAFI was represented by Kate Ridgway (1<sup>st</sup> vice president), Nev Roberts (QFRS FIRU) and Paul Cannington (QFRS Cairns). Geoff Perry (QFRS Brisbane North Community Safety) also attended.

The keynote speaker was Rebekah Doley BA (Hons) Grad Dip App Psych MSc (Inv Psy). Rebekah is a consulting psychologist having consulted nationally and internationally on arson-related issues. She lectures in psychological aspects of arson at the Charles Sturt University and conducts regular education sessions for fire investigator courses nationally. Rebekah has also developed a unique screening instrument for fire fighter selection.

Rebekah spoke on a number of topics including fire fighter arson, pyromania and the secret life of arsonists. Her presentations were both interesting and informative.

Other speakers included Paul Millet (Victoria Police formerly of the Arson Squad), George Cooney (Victoria Police Arson Squad), Phill Cribb (WA Fire & Emergency Services Authority), Steve Walkley (Tasmania Fire Service), Trevor Pillinger (VAFI) and Terry McCabe (VAFI).

The Chapter (and in particular Alex Conway and Bob Hetherington) are to be congratulated for their efforts and for putting on such a quality conference particularly in view of the logistical hurdles which were faced in the lead up to the conference. Only days before the conference, the proposed venue (MFESB Fire Safety Complex at Abbotsford) was shut down due to concerns of asbestos exposure. Fortunately The Australian Institute of Public Safety came to the rescue with the conference being held at its premises in Flinders Street.

Copies of the papers may be obtained from Kate Ridgway (O'Shea Corser & Wadley Lawyers) on 3222 4635.

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## QAFI Newsletter

The QAFI Bi-monthly newsletter is distributed to both members and non-members electronically in MS Word format. It is imperative that all members advise their e-mail address to enable the successful distribution of the newsletter.

The current edition of the newsletter contains a feature article by Brad Jeffs, QFRS Fire Scene Examiner on **"Criminal Behaviour Analysis - Is it all smoke and mirrors?"**

If you are not a Queensland Chapter member and would like to receive the newsletter (it's free), please contact Julianne via e-mail: [admin\\_officer@qafi.asn.au](mailto:admin_officer@qafi.asn.au) advising your contact details and we will add you to our mailing list.

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## Membership

Membership renewal invoices for the period 1 January to 31 December 2003 will be distributed during December. These will be due for payment no later than 31 January.

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## 2002 QAFI Sponsors – Thank You

On behalf of the QAFI Executive Committee and Members, we wish to sincerely thank our Chapter sponsors for their support throughout 2002.

**Major Sponsor:**  
**DEACONS** (Lawyers)

**Supporting Sponsors:**

Forensic Services Australia (QLD) Pty Ltd

W. Kennedy & Associates Pty Ltd

The 2003 sponsorship program will be released shortly.

## **An Interesting Case**

*The June 2000 issue of "Firepoint" featured an article on Kenny Richey, who was sentenced to death in Ohio, USA after being found guilty of murder, because investigators determined the fire in which a child died, had been deliberately lit. A worldwide network of supporters believe he is innocent (see [www.kennyrichey.org](http://www.kennyrichey.org)). The website has details of the case.*

*On appeal, Judge Gaughan quoted from an article by Tony Cafe, an Australian forensic scientist. Tony believes he was misquoted, and has been asked by Richey's lawyers to review the forensic evidence and prepare a submission, in a final attempt to save Kenny Richey's life. Tony believes that the forensic evidence is amongst the worst he has ever seen. The evidence is available on the web site. The case highlights the importance of an investigator's work, particularly when fatalities occur in fires. Tony's submission to the Court is produced below.*

### **UNITED STATES COURT OF APPEALS FOR THE SIXTH CIRCUIT**

#### **DEATH PENALTY CASE**

KENNETH T. RICHEY, Petitioner-Appellant  
v BETTY MITCHELL, Warden,  
Respondent-Appellee.

**AFFIDAVIT OF AMICUS ANTHONY CAFE  
IN SUPPORT OF PETITIONER KENNETH  
T. RICHEY**

I, Anthony Cafe, hereby depose and say as follows:

1. I am the proprietor of T.C. Forensic Pty Limited in Sydney, Australia. I have been investigating the cause and origin of fires for over 18 years and have investigated over 1000 fire scenes and analyzed over 2500 fire debris samples.

2. I am the author of *The Science and "Art" of Fire Investigation*, Firepoint Magazine, September 1998.

3. I am also the author of *Aids Used For Detecting Accelerants at Fires Scenes*, Firepoint Magazine, December 1993.

4. I have reviewed the decision of Judge Patricia Gaughan in the case of *Richey v. Mitchell*, 98-cv-1.418 (N.D. Ohio) dated April 3, 2001. I have also reviewed the materials submitted to that court by Professor Custer and Dr. Armstrong, as well as other publicly available materials on the Richey case.

5. I have no personal interest in this matter beyond properly explaining relevant scientific principles and I am not being compensated for any involvement.

6. I believe that Kenny Richey was convicted on unsound forensic scientific opinion and has been unfairly convicted. He is an innocent man who does not deserve to be executed in prison for this crime.

7. In the opinion, Judge Gaughan miscited and misunderstood my published articles. Judge Gaughan cited *The Science and "Art" of Fire Investigation*, but then quoted *Aids Used for Detecting Accelerants at Fire Scenes*.

8. The reason why investigators believe a rapid fire indicates the presence of an accelerant is because accelerants become totally involved in fire almost instantly. But there are other materials which will initially burn very quickly such as curtains or upholstered furniture and also, when a fire

reaches flashover, most combustible materials in a room will burn very quickly.

9. The speed of a fire largely depends on the availability of oxygen. Fires which are starved of oxygen, that is unventilated fires, will become rapid fires when supplied with a sudden supply of oxygen. For example, a fire smouldering in a closed room will suddenly escalate when a door is opened or glass in a window breaks because of heat.

10. Investigators are correctly told that reports of a rapid fire can indicate the presence of accelerants and the purpose of teaching this to investigators is so that they have a guide when they start their investigation. Reports of a rapid fire are only a tool which an investigator uses to plan the subsequent excavation of the scene. Such reports should not be used in an investigator's conclusion as to the possible presence of an accelerant.

11. Burn patterns can be very misleading and are not reliable in indicating an accelerant. For example, this fire had apparently reached flashover and so the floor and carpet would be exposed to high levels of radiant heat which would leave burn patterns on the floor.

12. The evidence of burning between cracks in the deck was used to indicate the presence of thinners on the deck. I always find that the fire damage around cracks in timber decking is the most severe found on the deck because the fire has a good supply of air coming up through the cracks, even when no accelerant was present.

13. It is not uncommon to find that smoke detectors have become detached from the ceiling during a fire because the heat destroys any plastic components involved in the means of securing the detector to the ceiling. It is also not unusual to find smoke detectors hanging from the ceiling by their wires because these wires are metal which can withstand much more heat than plastics.

14. The chromatograms from the Ohio Arson Crime Laboratory are of poor quality and were misinterpreted. I am familiar with gas chromatography and the methodologies in use at around the time of the fire. At that time, I was conducting research at the University of Technology, Sydney, Australia for my master's thesis analyzing fire debris with gas chromatography using methodologies that were widely used in the United States and reported in the scientific literature.

15. I agree with Dr. Armstrong's analysis of the chromatograms. I cannot see any evidence whatsoever in the chromatograms that indicate the presence of an accelerant. Simply put, the chromatograms for the samples from the fire debris do not resemble the chromatograms from the standard gasoline or standard paint thinner.

16. I am sure that most of the world's leading forensic scientists in this field would be horrified if they saw the chromatograms used to convict Kenny Richey. If Kenny Richey were executed on the basis of this scientific evidence, then these chromatograms will become historical documents, examined by scientists all over the world and used to show just how wrong forensic evidence can be. It would be a great tragedy for the future of forensic science.

Subscribed and sworn this 20th day of July, 2002.

Anthony Cafe

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#### **New email address for IAAI**

The email address for the International Association of Arson Investigators has changed; it is now IAAI @ firearson.com

The website for the IAAI is [www.firearson.com](http://www.firearson.com)

## **Application for Membership**

### **Association of Fire Investigators**

**(A Chapter of the International Association of Arson Investigators)**

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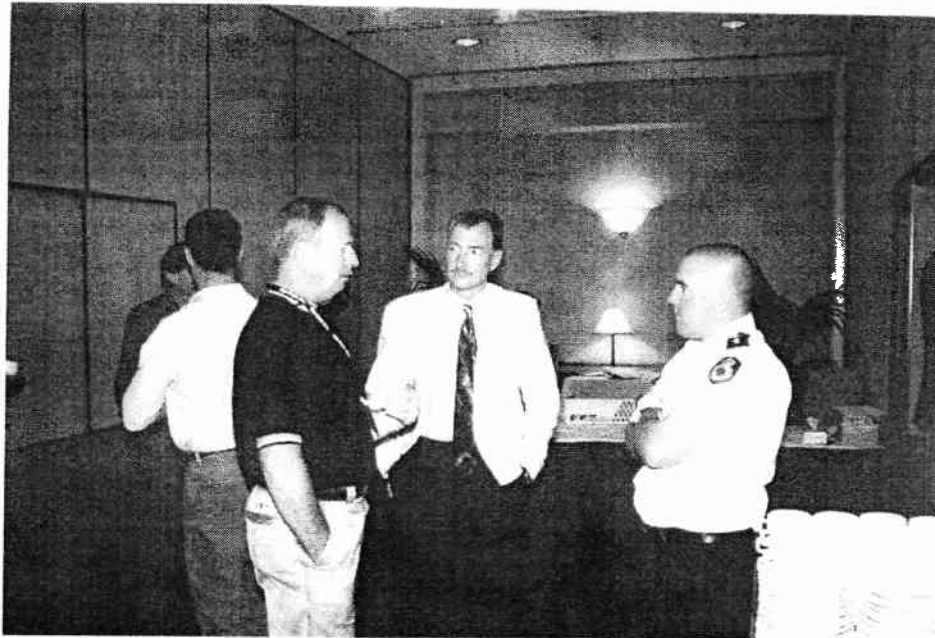
I hereby apply for membership of the Association of Fire Investigators in the State of ..... in accordance with its constitution and by-laws, and agree to be bound thereby.

I attach the amount of \$..... in payment of annual dues.

---

1. Name in Full
2. Address for Mail
3. Position Held (e.g. police or fire brigade officer, lawyer, investigator, assessor)
4. Company/Agency
5. Telephone
6. Mobile
7. Fax No.
8. E-mail Address
9. Signature
10. Name of Member Recommending you
11. Telephone No. of Member
12. Address or E-mail No. of Member
13. Signature of Recommending Member

Give your completed form with your payment to any committee member of the Association, or mail it to the appropriate postal address, as shown on page 3. This page also lists contact names and numbers if you have any inquiries.



Ross Brogan and Richard Woods with a conference attendee

## Inaugural Canberra Conference: 18 October 2002

*from Wayne Shaw*

The NSW Association of Fire Investigators conducted a one-day conference "Aspects of Fire Cause Determination" in Canberra at The Chifley on Northbourne in October. The subject material covered a wide range of fire related topics and proved to be both educational and interesting. The conference attracted about 50 delegates from all areas associated with fire cause and effect.

The executive Director of the ACT Emergency Services Bureau opened the conference. His opening address highlighted the importance of a co-operative approach to fire investigation between all agencies.

Senior Constable Rick McQualter from the ACT Coroners Office started proceedings and provided an overview of the Coroners role within the ACT. Followed by: Ms Lindsay Aquilina from the ACT Government Solicitors Office, whose presentation covered

courtroom proceedings and fire scene documentation; NSWFB Inspector and conference facilitator Ross Brogan covered fire and explosion investigation; Australian Transport Safety Bureau speakers, Jo Battley and Peter Foley covered Aviation fire investigation and Marine fire investigation respectively. Rick McRae from the ACT Emergency Services Bureau covered wildfire incendiaries and Ms Tara Hewett from the NRMA Insurance fielded a multitude of questions in relation to insurance fraud and fire.

I would like to take this opportunity to thank the conference organising committee (Kel Hannon, Ian Brandreth, Peter Cartwright, Tony Ross and Keith Chavasse) and Ross Brogan, who worked so hard to make the inaugural ACT conference a success.



***J.W. Munday & Associates  
(Australasia)***

***Forensic Fire and Explosion Investigation***

Due to circumstances beyond our control in the UK, the opening date for our new Australian business was delayed by a few weeks. We are pleased to announce that we will now be operational from Monday 16th December 2002. Our full office details are still to be confirmed but we have made interim arrangements as follows.

Mail: PO Box 309, Harbord, NSW 2096  
Phone: 61 2 9907 4991  
Fax: 61 2 9475 0661  
E-mail: munday.associates@investigations.com.au

We are also pleased to announce that our European operations will be handled by Forensic Alliance Ltd, who will augment our network of Associates with their in-house fire investigators and other forensic specialists. For further details, visit their website [www.forensicalliance.org.uk](http://www.forensicalliance.org.uk)

We will announce our definitive Australian office contact details and website address as soon as possible. We look forward to providing our Australasian customers with the same high quality service which our UK clients have come to expect.

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## Letters to the Editor

Please pass along my sympathy to our Australian colleagues for the bastardly bombing and loss of life in Bali. Being indirectly attacked in another country can be very frustrating to all public safety personnel and especially the families of those killed and injured.

There is no direct action that can be taken on the part of the survivors when the event happens far from home or in another country. I had attended a briefing back in June about the possibility of attacks in Indonesia. Their representative at the

briefing seemed not to be concerned. I realize that all these types of events cannot be stopped but a little prevention can do so much.

Please know we are thinking of you and stand ready to assist in any way we can. Stay safe.

Kirk Hankins  
Chair  
IAAI Certified Fire Investigation  
Program

## Working Together to Get the Right Answers. Part 1.

A paper presented in March, 2002 by **Jim Munday** to the Queensland AFI Conference.

*(In this issue we publish the first section of the paper. In the next issue of "Firepoint" the concluding section will be presented.)*

This paper is in three parts. I want to look at the general issues of "working together to get the right answers" to start with, before focussing on where those right answers impinge on ignition sources and in particular those ignition sources in commercial premises, giving one or two examples along the way. What I aim to do is to consider the past, present and future and to think about the importance of the ignition source in the whole process of fire investigation.

We need to realise that the ignition source together with the fuel, which is what most fire investigators are looking for initially, is not the same as the cause. The cause involves the mechanism by which they come together but without the ignition source it is not possible to determine the cause. We also have to think about the viability of the ignition source.

In the first part of the presentation, then, I shall discuss what are the right answers and how we work together to get them. In the

second part, I shall consider ignition sources in general and in the third part focus on some of the additional factors affecting ignition sources in commercial buildings.

Let us first consider why we need the right answers. There are several reasons.

The first one is to inform fire protection strategies; we have to remember that fire protection is more than simply a physical phenomenon. We are not just thinking about structural fire protection or fire fighting capability but also education programmes: teaching the public, and teaching the work force, how to avoid fire. This is something fire professionals are very familiar with, but the majority of people are not.

One of the essential factors in the ways that we can inform the community at large is through proper investigation strategies which decide what the real sources of ignition are, so that we can warn people about them.

Secondly, we have to think about improving design and construction - not so much of buildings but of fixed equipment, plant, heating, lighting, ventilation apparatus and also portable appliances and electronic equipment. This is so that we can actually avoid those

becoming ignition sources for fires.

Thirdly, we also need to work together and use the right answers to inform and direct research and development. There is no point in researchers carrying out projects if they have no relevance to the real world. Similarly with product development; design engineers need accurate information - this fits together with improving design and construction.

Unless there is accurate information about what ignition sources actually are out there, and which of them are causing genuine problems, then it is impossible for product developers to address the issues and improve safety.

Fourthly, we have to inform legislation. By this I mean that we have to get the message across to those who make law about what the real ignition sources are and what the real problems are. This is so that the laws and regulations which are made are good and effective, and are not just either so-called "stable door legislation" (always reacting to major disasters) or alternatively wrongly-directed legislation, reacting to a problem which doesn't really exist.

Finally we need the right answers in order to respond properly to criminal activity. We have to be able to identify deliberate fires and

identify and convict those who light them. At an earlier stage we need to be able to identify people who are at risk of moving into a career of fire setting, such as juveniles, and have appropriate intervention programmes with which we are going to deal with those people.

All these things rely upon the investigator actually determining what is really going on in terms of the ignition sequence of the fire.

Who needs to work together to get these right answers?

The first group of people are obviously the investigators. These may come from public services such as the fire services, the police scenes of crime departments or maybe the forensic scientists that work with the police or fire service.

They may be privately funded, particularly by the insurance companies, and again there are forensic consultancies involved but also claims inspectors and so on. All these people need to communicate with each other, all these people need to work together in order to get the appropriate answer for their terms of reference.

The relationship between investigation and research requires good communication. One of the problems over the last 20 years or so, which is now being addressed better, has been the researchers and investigators not really talking to each other properly, not

communicating, not working together. This is now being addressed in the UK; for example, the Fire Research Station holds an annual event in which fire researchers and fire investigators come together and hold a seminar. By doing this, we can explore what has been discovered recently that alters the investigator's perception on how fires begin, develop and spread, and what has been found by investigators that researchers can use to feed back into their programmes (for example in the case of modelling we need the information from real fires to validate some of the research assumptions).

The next group of people are the designers. Designers of equipment, buildings, processes and so on have to be aware of what investigators and researchers are finding in terms of ignition sources and ignitability of materials, so that they can make the appropriate decisions in terms of their designs.

Again there has been a problem historically with designers tending to work in a vacuum, with very little regard paid by them to the results of either fire investigations or fire research. This situation has to be addressed but clearly requires accurate information to be passed on.

Finally we need to think about the legislators. The laws which are going to be passed will be based on the input that comes from the investigators and researchers

telling the legislators what the problems are, and what the solutions are. The legislators, who are broadly speaking politicians and not technical people, are not in a position to assess these things for themselves and they need expert advice from the fire investigation and fire engineering community.

Hopefully we can all agree that we have to work together to get to the right answers but what are the right answers we are looking for? What are the appropriate answers in terms of fire investigation?

The first one that we really need to ask is: what was the ignition source? This may sound straightforward but is in fact sometimes one of the most difficult things in a fire investigation to answer. It is relatively common to come to the area of origin of the fire and have the choice of three or four potential ignition sources within that area. In this situation we have to think about ways in which we can identify which one is in fact the correct ignition source.

We must ask how did it happen? By this we mean what was the mechanism for bringing that ignition source and the fuel together to cause a fire. Maybe that ignition source and that fuel are always present there, so why was it that on this particular day they caused a fire? Was there some sort of misuse or malfunction? Was there maybe a process failure or a design fault? Or was a person to blame: is

somebody liable, was there some contributory negligence or was there even a criminal act?

We need to consider all these aspects because ultimately what we are trying to do is to stop that situation happening again. Here we can see the link between simply looking for ignition sources and the wider field of fire investigation, both in terms of the physical science and the human behaviour.

All this is very well in theory but we have to understand where the information we are going to use actually comes from.

Obviously to start with we are going to think about on-site investigations. Here we have the investigators, who as I said may be fire service, police, or forensic science based people, who are gathering information to try to assess the most likely ignition source for that fire and feed that information back into the system.

Sometimes, however, it is not possible from a scene investigation alone to determine the ignition source. There may be a number of reasons for this; perhaps the damage is too severe, perhaps there are a number of potential ignition sources within the area of origin and it is not possible to determine exactly what has gone on from the physical evidence. It may be that the fire has been so severe that the entire site is levelled and we then have to

start thinking about alternative approaches.

One of the alternatives is to consider the documentary evidence. This may be documentary material associated simply with that fire, for example in a factory it may be records of maintenance or information associated with the processes involved. It might be documentary evidence of a more general nature, such as background scientific papers.

We then have to think about searching all that literature to find about if someone has come across a similar problem before, whether researchers have studied the potential mechanisms involved and how we go about solving it.

We can also get a lot of information by talking to the "victims", in the broadest sense of the word. That is to say, not only people that are victims in the narrow sense of being injured or made homeless, but people who are affected by the fire: people who were present when the fire occurred; people who worked in the factory or hotel or whatever the occupancy is, who have some back ground and can give us some information; people familiar with the location, contents and routine activities.

Some of the information we are looking for may come from pure research. There is a lot of fire research going on around the world, which is not directly aimed at solving a particular problem

in a particular fire but looking at fire behaviour in general, ignition processes in general, ignitability of materials and so on. We can call on that research in any job that we are involved. Even when the research was not aimed at helping in our particular investigation, we can use the results; all that published material is available for us. We can use it and we should use it; one of the problems I see quite frequently in my consultancy practice is a lack of appreciation by many investigators of the wealth of information which is available and how to access it. If there is only one message from this section of the presentation, it is to go out and find out about all the information that's available and how to get hold of it.

Once we have gathered all this information about the ignition source and how the fire started, what are we going to do with?

Much of the information gathered by fire investigators goes towards records which are analysed statistically, and these inform many of the fire protection and fire precaution strategies in countries around the world.

In fact this is historically the standard method of targeting fire prevention campaigns, public education and so on. These are based around the statistical analyses of fire cause, which obviously includes the ignition source. If the investigators have not identified those ignition

sources correctly, then the whole of those statistical analyses are going to be skewed and that will have a knock-on effect on the fire prevention strategies.

We may compile purely factual reports. Sometimes a factual report is all that is needed, i.e. "this is what happened" and someone else can take it from there. The people who will look at that factual report may be, for example, the operators of a process or the owners of a factory or a commercial environment, or they may be other people such as legislators.

Any of these may simply look at a factual report and decide there is a problem here, it's clear what the problem is, if we just stop this problem then we've solved the issue of fires happening. A simple piece of legislation or better practice may well accomplish that.

However, very often the client or "ultimate customer" will turn to the investigator for more of an expert opinion, that is, what do you think really happened here? or (more importantly) what do you think is our best way forward? This is a very important factor for the fire investigator and it is essential to realise that our expert opinions are very highly regarded.

They must therefore be accurate, unbiased and informative. To be accurate overall we have to be accurate about our cause of

the fire and that means being accurate about our ignition source. If we fail to be accurate in any of these areas, then our expert opinion is flawed and eventually we will lose our credibility; not just as individuals but as an industry and as a professional community.

Taking factual reports and expert opinions together, what we are really trying to do here is to advise decision makers. I would argue that this is our real function as investigators in the whole fire safety process.

These decision makers can be from a very wide range; as above, it may be the MD of a company who decides on a different way of doing things, it may be an insurance claims manager reviewing a claim, perhaps a judge who is deciding on a matter of liability or negligence, or it could be a jury in a criminal trial who are deciding on a matter of guilt or innocence.

It may be a legislator or a group of legislators who are deciding whether or not to produce some more fire safety statutory requirements, so it is very important that we get our information absolutely correct.

Ultimately everyone's aim has to be to improve community safety. We can achieve this in a number of ways. We give people the information that they need to educate the public, the work force and the management of companies.

We pass on information to designers, manufacturers and so on to enable them to rectify defects. So, for example, feedback from investigators all around the world who have been identifying problems in a particular electrical appliance will hopefully cause the company to modify the design to remove that problem or defect and thereby save lives.

My colleague Mick Gardiner often says that a faulty appliance if not rectified can kill more people than the most determined serial arsonist. I think that is worth bearing in mind when we are trying to be accurate about the origin and the ignition source of our fires. We can also consider systems improvements. We can look at the way processes work in factories etc. and suggest improvements to those systems.

Finally, we must realise the importance of deterrence. Obviously if we are good at investigating fires, that is good at establishing the origin and ignition source and therefore identifying the cause, we will identify more of those deliberate fires and hopefully we will help convict or deter more fire setters.

Having considered who should work together and why, I shall now move on to the second part of the presentation and consider ignition sources in general.

This will be just a brief overview of ignition sources

with some examples. There is, of course, an old fire brigade joke that the three main causes of fire are men, women and children; I think there is a certain element of truth in that but men, women and children have to have some means of actually producing the fire. Some examples of ignition sources are given here but I have to stress this is not a comprehensive list. Each reader will no doubt be able to think of other examples which could equally well claim to be included.

### Flames

Obviously this is the first one that everyone thinks of as an ignition source. A typical flame source that everybody considers might be matches or cigarette lighters, but there is another that is growing in popularity and causing more and more problems for firefighters and fire investigators around the world. These are candles. Candles have had an enormous resurgence in popularity, particularly in developed countries, and another of my colleagues (Stan Ames of Fire Research Services) estimates there are more candles in use in the UK now than there were in Dickensian times. I find that quite a frightening thought because, as someone else has pointed out, modern societies perhaps do not have the same level of discipline in handling candles as our forefathers did, who were used to handling them all the time as essentials of lighting. We have them as recreational items and perhaps we do not exhibit

the right degree of caution in dealing with them.

Candles have caused a lot of major fires and great loss of life in this country and the USA; I suspect it is very much the same in Australia and New Zealand as well.

### Smouldering sources

Clearly, the classic among these is the lit cigarette. These are deemed responsible for very many fires but there is a school of thought that they are blamed for far more fires than they actually start. This is a view to which I subscribe but nonetheless it is certainly the case that they do start fires on occasion. There are of course many other kinds of smouldering sources as well. The Australian readership is probably more familiar than I am with barbeques (we don't tend to get that many BBQs in the UK because every time we light one up it rains) but you will know all about the hazards of disposing of BBQ coals properly and so on.

### Radiant heat sources

Radiant heat sources such as heaters, etc. are obviously a major source of ignition. Obviously there are climatic factors involved in the frequency of use of radiant heating in both domestic and commercial premises, but radiant heaters can also be used in industrial processes

### Hot surfaces

Some types of cooker fall into this category, such as electric and ceramic hobs, but we must also consider various industrial processes

and other equipment with hot surfaces, along with those associated with vehicle engines.

### Electrical heating

Electrical causes of fire are another whole topic on their own and perhaps the subject of a future presentation. In the meantime it will probably suffice to say that we all know there are many fires which are attributed to electricity, some of which may actually be due to electrical heating. There are several mechanisms by which this could occur, often summarised by the phrase "abnormal electrical activity". However it is important to clearly differentiate between this, the result of a fault or malfunction, and the misuse of heat-producing electrical equipment.

### Static electricity

Although small static discharges contain relatively little energy, they can be very important ignition sources for dispersed phase fuels such as vapours and dusts. In an industrial context these can be highly significant. Of course, on a much larger scale, lightning strikes have massive heating effects and can lead to the rapid ignition of substantial solid combustibles.

### Chemical reactions

Among these I include self-heating of materials such as animal feeds and vegetable oils, as well as chemical reactions where two or more materials are brought into contact. Obviously these are much more common in a commercial setting than a

domestic setting but that does not mean they can always be eliminated in a domestic fire.

#### Frictional heating

Where there is a lot of mechanical plant, with numerous moving parts, and also in vehicles etc. this can be a very important ignition source. Again, although less common in a domestic context, it is by no means unknown – bearing failures in domestic appliances are just one example.

#### Solar heating

Although relatively uncommon, solar heating is perhaps surprisingly a well-recognised risk in high latitudes because of the low incident angle of sunlight during the winter months. It must be remembered that even in the hottest climates, the sunlight still needs to be concentrated by a lens or curved reflector to cause ignition. In one very hot summer (by UK standards) when the daytime maximum reached around 40 degrees Celsius, a TV newsreader was heard to claim that the high ambient temperatures had caused grassland to catch fire. Given that the human body temperature is around 37 degrees, presumably he thinks we run the risk of igniting the lawn whenever we lie on it?

It is necessary to consider what sort of evidence can lead us to the correct ignition source. Each type of ignition source is going to have a certain amount of evidence associated with it, both physical and possibly other evidence as well such

as witness accounts, so we need to recognise the main features.

Firstly, we can consider the rate of development. Obviously a flaming ignition source will usually produce a faster initial rate of development than a smouldering or other ignition source. For example, if solar heating is involved there will be an incipient period where the substrate (the fuel) has to warm up before it can start to decompose and flame. That period will usually be longer than if applying a flame to it.

We need to think about the intensity and the scale of the damage: is there widespread even damage typical of a flaming fire and, if so, in what time scale has it occurred and is that really consistent with anything other than a flaming ignition source? Alternatively, is there very intense localised damage of the type you would normally associate with a smouldering fire and, if so, can we determine at what stage of the fire this was produced?

Is there any physical evidence remaining of the ignition source? We may dig down in our area of origin and find pieces of a radiant heater or a cooker or some heating and ventilation or some electrical equipment. We then need to think of what test could be done or what sort of examination carried out to establish that it really is the ignition source and not just a piece of equipment that

happens to be in the area of origin.

We should consider the witness evidence or other evidence of the pre-fire conditions. We may be very lucky and have CCTV footage or other surveillance photographs; there may be documentary evidence of pre-fire conditions, for example instrumentation in a plant or factory where processes are running. In such cases, we may have instrumental records leading right up to the point of ignition which tell us exactly what went wrong.

The question we most often need to ask as investigators is “what was different this time?” For example, in a situation that has been going on perhaps in a factory or in a warehouse environment for months or even years, where the same fuels and the same potential ignition sources are always present but a fire has never occurred before. The real question then is why has the fire occurred now – what has brought these together, why is the fire today and not yesterday?

So what are some of the essential factors that we have to consider when we are thinking about the viability of an ignition source, that is when we ask ourselves is this really the ignition source that caused this fire?

It is essential to understand and consider the difference between temperature and heat. There is a lot of talk among less well-informed

investigators about the temperature of ignition sources; for example the autoignition temperature of paper is around about 260 degrees Celsius and so, strangely enough, is the autoignition temperature of petrol. The temperature of a glowing cigarette tip is well above that, around 600 or 700 degrees C. Now we all know that if I throw a lit cigarette into a bin full of crumpled paper it is possible to produce a fire but we also know that if I throw my cigarette into a pool of petrol vapour a fire will not result. (I suggest everyone should try this out for themselves or at least read what John DeHaan and Robin Holleyhead have to say on the subject).

Why is this? The answer is actually very complicated with cigarettes and petrol, but basically it is because there is a fundamental difference between temperature and heat. We have to think about the amount of heat in the ignition source as well as the temperature of it, and we also have to understand the way that heat energy is transferred. In other words, what is the mechanism of that transfer? Is it mainly a conductive transfer, as it will be with a hot surface? Is it mainly a convective transfer or a radiative transfer? (For example, a flaming ignition is a combination mainly of convection and radiation).

We must understand these concepts when we are looking at how the fuel becomes ignited and

consider what is the mechanism by which the energy is being transferred from the possible heat source to the fuel before we can be certain that it is indeed the ignition source.

Not only the mechanism but the rate of energy transfer is important. How fast is that amount of heat being transferred and is that sufficient to raise the temperature of the fuel in the immediate vicinity to its ignition point, before the energy is dissipated into the body of the fuel and/or the atmosphere? An important aspect of rate of energy transfer is that it applies at even at very low total amounts of energy. If the rate of transfer is high enough, then even with a small amount of energy there could be local conditions which are enough to initiate an ignition.

An example of that would be a gas explosion. In his book, Harris quotes the ignition energy for methane gas as 0.3mJ; now that is a very small amount of energy. If it is dissipated slowly through a methane-air mixture, ignition will not occur but if that 0.3mJ is in the form of a spark (which happens very quickly) then there is a much higher rate of transfer of energy, which is the deciding factor in whether that mixture will ignite or not.

We also have to consider the fuel state and its disposition, that is how the fuel is arranged with respect to the ignition source. Is that fuel finally divided or is it a

block, is it thermally thick or thermally thin? Answers to these questions are essential in order to determine whether a particular ignition source (or potential ignition source) is in fact viable for that particular fuel, in that state, under those conditions.

As a very simple example, we know that if we get a large block of wood we cannot ignite it directly with a small flame but if we take shavings from the same wood we can easily ignite them, because the fuel type and disposition has an effect on the energy transfer.

We also need to consider any factors which may be present which might inhibit that energy transfer. We know that we need to have a chain reaction to start and be sustained in order to produce a flaming fire; is that chain reaction going to start or progress, or is there a factor there which will inhibit it from starting? Examples include excessive moisture or an atmosphere containing radicals which will interfere with the reaction. Even in a smouldering fire we need to think about whether the surface will heat up enough to sustain the smouldering or glowing combustion, without the heat being dissipated either to the atmosphere or conducted away into the bulk of the materials. Again this comes back to both the fuel state or disposition and the rate of energy transfer.

*(The final part of this article will be in our next issue).*