

FIREPOINT



IAAI JOURNAL



Firepoint

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EDITORIAL

In a recent Letter to the Editor in the "Sydney Morning Herald", Ken Hancock wrote :

"in limited forays into the bush in hot weather, I have seen two incipient fires (less than a square metre) that were clearly started by inadvertant arsonists. The first was in the Blue Mountains and was started by the sun's rays through a large beer bottle. Even though the temperature was less than 30°C and the bottle was under almost full tree canopy cover, it was at the epicentre of a small but spreading fire.

The second incident was caused by the sun's rays focused by the concave bottom of an aluminium soft-drink can. This was on a hot, dry, still day.

With the millions of cans and bottles spread through the bush how often does this happen, if I have seen it twice? Bottles last a long time and even cans retain their lustre for many years. I believe that a lot of fires are started this way.

It is disappointing that the fire authorities give so little credence to this possible cause of fires, when some simple experiments, and probability calculations may lead to future preventitive action".

More about this topic on pages 23 and 24 of this issue. How often are bushfires really deliberately lit? What evidence do we have? I invite your views on this matter.

Wal Stern

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QUEENSLAND NEWS

WELCOME

Happy New Year and welcome to the first edition of Firepoint for 2002.

The first quarter of the year is an important time for the Chapter as there are many housekeeping issues such as Membership renewals, Activity Plan and Annual General Meeting that need to be addressed. Please take a few moments to review the updates on these issues further on in the report.

Our Conference / major training seminar to be held from the 8th to 9th March in Brisbane has kept the conference committee extremely busy over the past few months. The conference offers a challenging program encompassing the theme "Prevention is Better than Cure".

The registration fees to attend the conference have been kept to a minimum as a result of the additional conference sponsorship support received from;

"Gold Sponsor"

PACIFIC ADJUSTERS PTY LTD

"Bronze Sponsor"

KENNEDY'S (FORENSIC)

While the conference is privileged to be able to feature distinguished guest speakers, it is intended that the driving force of the conference will be the discussions and information exchanges between delegates themselves.

We trust members will support this initiative and look forward to seeing you at the conference.

MEMBERSHIP RENEWALS

Membership renewal invoices for the period 1 January 2002 to 31 December 2002 have been issued and are now due for payment.

Reminder invoices will be issued to those with outstanding fees as at the 28th February.

2002 CHAPTER SPONSORS

On behalf of our members, I wish to sincerely thank the following organisations for sponsoring our Chapter throughout 2002.

Major Sponsor

DEACONS (Lawyers)

Supporting Sponsors

FORENSIC SERVICES AUSTRALIA (QLD) P/L

KENNEDY'S

(Loss Adjusters, Technical & Risk Consultants)

UPCOMING EVENTS

Date: 8-9 March 2002
Event: Conference – 2 Days
Venue: Royal On the Park & QFRS Training Academy, Lytton

"PREVENTION IS BETTER THAN CURE"

Day 1 Conference & Formal Dinner
Royal On The Park, Brisbane City

Day 2 Live Fire Demonstrations
QFRA Training Facility, Lytton

Overview

The project will focus on the theme that prevention is better than cure – the emerging relevance of risk assessment processes to losses caused by fire.

Date: 27 March 2002
Time: 12 – 2.00pm
Event: Members Lunch & AGM
Venue: Stamford Plaza, Brisbane
Raffles Rooms

At the time of going to print, unfortunately the guest speaker and topic for this function has not been confirmed. Full details will be advised to members as soon as possible.

QUEENSLAND NEWS

The Annual General Meeting will be following the guest speaker presentation.

All Enquiries relating to upcoming events should be directed to Julianne Foley either by phone on 3822 4700 or email admin_officer@qafi.asn.au

2002 CHAPTER COMMITTEE NOMINATIONS

Nomination forms for Office Bearers on the 2002 QAFI Executive Committee have been forwarded to members.

Please consider taking an active role in your Association. It is your valued skills that will ensure the future success of the Association.

All nomination forms must be received by Wednesday 13th March 2002.

IAAI EDUCATIONAL FOUNDATION

"Train-The-Trainer" Grant

As a commitment to provide training throughout the world, the IAAI Educational Foundation has issued an \$800 (USD) grant to help offset the cost of attending the IAAI Annual General Meeting and Seminar to be held in Milwaukee, Wisconsin.

Our Chapter is entitled to receive one of the grants to assist with the costs associated with attending the 2002 IAAI AGM and Seminar.

The QAFI Executive Committee following review of all applications received will make selection of the Chapter recipient no later than the 29th March 2002. The grant may be used for registration, airfare or other seminar related expenses. The chapter member who attends must submit with the application form a letter stating they will utilise the information learned at the seminar. This would provide training for their chapter members upon return home from the 2002 Annual meeting in Wisconsin. The QLD Chapter is now calling for applications from members who would be interested in attending.

Please contact Julianne on 3822 4700 to receive full details on how you can apply for this Grant.

2002 IAAI AGM & SEMINAR

The 2002 53rd IAAI Annual General Meeting and Conference will be held from the 19th – 24th May 2002 at the Sheraton Four Point Hotel, Milwaukee, Wisconsin USA.

Registrations received prior to 1st April for IAAI Members is \$300 (USD).

Additional details can be found on the IAAI web-site www.firearson.com

NSW BUSHFIRES - \$70MILLION

Insured losses from the NSW bushfires in the Christmas-New Year season are expected to top \$70 million. The Insurance Disaster Response Organisation (IDRO) said claims will number well over 2,000.

Most claims are for relatively minor amounts – damaged sheds, loss of fridge contents, etc.

FIRE SAFETY IMPROVES IN QLD HOMES

Almost 25,000 Queensland homes improved their fire safety standards during the past year, with almost 90 per cent of Queensland homes now having some level of fire safety.

The figure is highlighted in the Productivity Commission's Report of Government Services 2002, released beginning of February.

The report showed there had been a continued improvement with the number of homes in Queensland that had smoke alarms, a sprinkler system and/or a safety switch/circuit breaker.

Another pleasing aspect of the report was that Queensland continued to maintain its low fire death status, which in 2000-2001 was half the national average.

####

Application for Membership

Association of Fire Investigators

(A Chapter of the International Association of Arson Investigators)

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.

THE USE OF DIGITAL PHOTOGRAPHY FOR FIRE INVESTIGATION

CHRIS DAY
LEADING FIREFIGHTER
MELBOURNE METROPOLITAN FIRE BRIGADE

SUMMARY

This report discusses the use of digital images for Fire Investigation Reports.

It looks at the use and acceptance of digital images in Victoria's Court system. The report considers the help that digital images would afford Fire Investigators and also highlights some possible problems that may need to be addressed, prior to the introduction of digital imaging.

The operating costs and purchase prices of several systems are noted. The complete report and the recommendations made are intended to promote further discussion among Fire Investigators and other interested parties, and also to assist the Melbourne Metropolitan Fire Brigade, in making a considered judgment about the advances in digital imaging technologies and the

related systems of storage and handling.

WHAT ARE THE DIFFERENCES BETWEEN TRADITIONAL PHOTOGRAPHY AND DIGITAL PHOTOGRAPHY

Traditional photography requires film and chemicals to create images. The camera takes the picture and the image is transferred to the negative.

Prints are then made from the negatives. Traditional photography has been subject to claims of alteration many times over the years. The magazine POPULAR SCIENCE had a cover showing an "F-15" flying over the Kremlin, this was a traditional type photograph that had been tampered with.

Nevertheless, there has always been an original negative, that can be examined to determine if a photograph has

been altered, balanced, cropped, sharpened, etc.

Digital cameras use electronic imagery. Visual images are captured and stored electronically.

Electronic information comprises the visual digital images. No film



Kodak DC 5000

or paper is used in capturing digital images. Those digital images are reproduced instantly and do not degrade at all over time. Although they may ultimately be displayed in printed form, the use of monitors or display screens may mean that there is no need for an analog [hard copy] of the image.

HOW DO DIGITAL CAMERAS WORK?

The way a digital image is created is an interesting technique, and can be simply explained thus, light falling upon a grid of detectors known as a *charge coupled device*, or CCD, produces a pattern of electrical charges that are measured, converted to numbers, and then stored.

The process can be compared to a group of water glasses set out in a grid pattern to collect rainwater. The amount of water collected in each glass will vary according to the pattern of the rainfall at any given point above the glasses. Once the rain has stopped, the glasses are collected and carried one at a time, much like a bucket brigade, to a metering device. The metering device measures the quantity of water collected in each glass, converts the amount to a number, such as six ounces, and then record the amount before moving on to the next glass.

In a digital image, the quantity of light collected by each sensor, or glass, is measured by the

metering system and recorded as a number. This number is stored in the same grid position as the sensor that collected the sample.

As each subsequent sample is measured, its value is stored according to its position in the original grid of sensors, or glasses. Each value in the grid corresponds to a picture element (also known as a pixel) in the digital image.

Each pixel is displayed on a computer monitor, beginning in the upper left corner, by a tiny light bulb that takes on a particular color or shade of gray according to the number recorded for the grid point it represents.

The computer reads the number assigned, checks an index of colors to determine its color equivalent, and then adjusts the corresponding light bulb (pixel) on the computer screen to match the color value. The computer then moves on to the next pixel in the grid, repeating the process until all the pixels in the image are displayed on the computer screen.

The end result is a mosaic of dots that fit together and represent the original scene. The greater the number of pixel's, the better the resolution. The numbers of pixels are identified as PPI-pixel's per inch. Higher resolution images offer finer details and appear sharper. To create the clear images needed by Fire Investigators, an image needs to contain 2,000 000 pixels minimum. A digital camera contains random access memory (RAM). When the maximum number of RAM is used, RAM must be restored. That can occur by erasing images, installing new RAM, downloading to a computer or burning to CD. Until a digital image is either printed or displayed on a computer screen, it has no visual form. It is completely dependent upon a host computer for its existence as a visual record. The potential for unintended alteration or corruption of a digital image is great. Electrical power surges can scramble the binary bits that define the image. Hardware failure can destroy the media upon which the image is recorded. Computer viruses can seek out and destroy the image.

Co-workers, who say, "I know all about computers" can be a serious threat to digital images. One or two errant commands could be enough to destroy precious image data.

INTRODUCING DIGITAL CAMERAS INTO ZONES

Some of the benefits that I can see for the zones are:

- That the cameras could be made available for everyday use within the zone
- The downloading of the images would allow for rapid availability and distribution of photos via e-mail or within the computer network.
- Deletes the ongoing costs of developing associated with conventional photos
- This format allows photos to be enhanced cost effectively without compromising the integrity or reliability of the image.
- Simplicity of camera use.
- Able to review and dump unwanted or poor quality images at the scene.

- Ability to ensure that photographic evidence collected at the scene is adequate, as the images can be reviewed immediately without the delays associated with film based photography.

Having sought opinion from the Zone Commanders, it appears that all zones currently have Digital cameras for one use or another, though none have a dedicated Fire Investigation camera. A suitable proposal from the Fire Investigation unit for inclusion in the various zones budgets, may receive favourable consideration from the zones, as there was no resistance to the idea of a Fire Investigation camera.

It would be possible to transfer the images to F.I.A, via either the internal mail or the zone car after the Investigator has transferred the images to Serial Numbered Compact Disc. Alternatively the images could be stored on computer for F.I.A access via the network and then transferred to writable CDs [CD R].

* Fire Investigation department's costs for developing per annum are approximately \$ 1700.

In comparison, CDRs currently cost around a dollar and can store between 80-150 images, depending on the resolution.

TRAINING

The training of all the personnel, who may potentially end up in court to verify the authenticity of an image, should be covered in the proposed new Standard Operating Procedures [S.O.Ps].

Those who would use digital imaging to record objects or events that will later end up in court would be wise to consider these issues carefully. When the defence claims an image was altered, it will be the prosecution that has to prove it is not so.

Adequate documentation is a good place to start, but specific knowledge about digital images, how they are created, and how they can be changed, must be learned through training and practice.

When speaking with Personnel in our Fire Vision Department, they were confident that a training course could be run internally at the Training College.

Alternatively most of the larger camera retailers offer basic courses inclusive with the purchase of a camera.

Policies and procedures establish how and when digital imaging will be applied. They also demonstrate to the Defence Counsel that the **Fire Brigade** stands behind the use of digital imaging as a tool.

When followed, the policies and procedures can also serve to reinforce the testimony of those who must defend its use in court. When they are not followed, or where there are no established policies or procedures, the witness is left to him or herself against a group of people who are paid to find **fault**, no matter how small or insignificant.

DIGITAL PHOTOS IN COURT

There is little doubt that, over time, digital imaging will replace film

as the preferred method for recording crime scenes, and the evidence found in them. How the Australian legal system adjusts to this technology is yet to be determined.

History has demonstrated time and again that Australian jurisprudence adjusts to new methods slowly and deliberately.

The Australian courtroom was modeled after early nineteenth century English courtrooms that were designed to cast a defendant's accusers as actors in a stage production that frequently resembled the latest plot in a modern soap opera. The Barristers produce the show, and a Magistrate ensures everyone plays his or her part according to the rules.

This description might seem trite to some, but recognizing the similarities between a legal battle and a Broadway play can help an expert witness to better understand his or her role and how to play that role effectively.

The Australian system of justice is not known for its expedience and

legal tradition demands that any deviation from historical precedent be considered carefully. New case law is not something most Magistrates seek to create. This of course is also affected by how the individual Magistrates perceive new technology.

After speaking to the Information Technology Coordinator for the Melbourne Magistrates Court it seems that the use of the digital format is accepted and encouraged as the best evidence principle.

There are already well accepted forms of digital evidence produced in Victoria's courts, some examples of these are.

- Breath testing equipment
- Total survey system *
- Radar equipment

Such uses have already faced many challenges in court, and have become the standard as far as the particular areas they cover. Digital imaging of course is still subject to challenges in the courts and would have to follow the current Chain of Custody procedures.

Total Survey system is used by the Accident Investigation Team to map out the entire scene, including measurements, which can be reviewed in detail at a remote location.

How the courts will ultimately address the issues raised here remains to be seen.

In the end, when an image is introduced in court, the first question that will need to be answered remains "Is this image a fair and accurate representation of the scene or object as it was found?"

Questions about the Chain of Custody or the validity of specific computer enhancement techniques will ultimately be answered in accordance with the recognized scientific principles of the day. However we can ensure that our training and procedures are in place, and are adequate to withstand the scrutiny of the courts.

Case History

One of the first cases tried in the United States involving the use of DNA evidence to connect the suspect to the scene of the crime

was the murder of a woman and her two-year-old daughter in the Bronx, New York, on February 5, 1987 (Levy 1996). A suspect was developed shortly after the murders and was interviewed by the lead detective on the case. During the interview, the detective noticed a stain on the suspect's watchband. The watch was taken as evidence and later analysed by Lifecodes Laboratory in Westchester, New York, which concluded that the stain was blood and matched that of the adult victim with a one in 100 million probability among the Hispanic community. Armed with this information and the testimony of several witnesses, Deputy District Attorney Risa Sugarman felt she had an open-and-shut case. The public defender assigned to the case enlisted the help of attorneys Peter Neufeld and Barry Scheck, who were beginning to build a reputation for their knowledge of DNA and forensic evidence. With the assistance of Dr. Eric Lander, an MIT scientist, they set out to prove that Lifecodes' procedures were faulty and, as a result, that their conclusions were overstated.

Dr. Lander examined Lifecodes' DNA test films and discovered two unexplained differences between the DNA found on the suspect's watchband and the DNA of the adult victim.

Dr. Lander questioned Lifecodes' laboratory procedures and found there were inadequate controls in place to guarantee that tests would not be influenced by bacterial contamination. In the end, Lifecodes admitted their controls were insufficient to ensure the reliability of the laboratory's test results.

In a deal designed to minimise the damage to Lifecodes' reputation, they agreed to change their conclusion from one of almost certainty to *"The DNA results were inconclusive."*

The defendant in this case later agreed to a plea bargain in which he admitted to both murders, but at a greatly reduced sentence.

Interestingly, the validity of DNA as a means for identifying a suspect in a crime was not drawn into question; only the procedures used by Lifecodes to form a conclusion were attacked.

The American justice system has documented hundreds of criminal cases that have been lost due to sloppy or inadequate evidence handling procedures.

It is well worth reflecting on these cases in terms of digital imaging. Whilst the validity of digital imaging may not be drawn into question, the handling and security of the images certainly will.

Digital imaging is a science and, as such, must conform to accepted standards and the applicable rules of evidence. Ignoring this basic requirement, risks damaging the acceptability of this powerful tool in future prosecutions.

PHOTOGRAPHS AS EVIDENCE

The principle requirements to admit a photograph into evidence are relevance and authentication. In general, a photograph will be admitted into evidence at the discretion of the trial judge. In rare cases a chain of custody (including custody of the undeveloped film) will be required, or the best evidence rule may be invoked if the

photograph is offered for its truth and is the basis of a controlling issue in the case.

Chain of custody can be one of the most difficult issues faced by the forensic professional trying to introduce a digital image as evidence in a criminal case. If a defendant alleges an image has been altered, or could have been altered, the burden of proof falls upon the state to prove otherwise.

If the image is an integral part of the Prosecution's case, linking the defendant to a crime scene, it is inevitable that the defence attorney will raise a question about the integrity of the image. In many cases, the success of the argument will hinge upon the procedures used to safeguard the security of the images

The most important of these requirements is authentication.

Unless the photograph is admitted by stipulation of the parties, the party seeking to introduce the photograph into evidence must be prepared to present testimony that the photograph is accurate and correct. In most

cases, the testimony need not be from the photographer; any witness qualified to testify that a photograph accurately portrays a scene familiar to that witness, will suffice.

Some courts will rule a photograph is self authenticating or presumptively authentic. If the authenticity of a photograph is challenged, it is usually a question for the trier of fact to settle.

There are few evidentiary problems raised by intentionally manipulating images, so long as a witness is available and willing to testify that:

- The witness is familiar with the scene/object.
- The witness explains how he/she is familiar with the scene.
- The witness recognises the scene/object.
- The image is a fair representation of the scene/object at the time.
- That the scene has been edited!*

* Documenting how these changes were achieved is also good practice, eg contrast increased-12 points, brightness increased-15 points,.

Keeping an original unalterable record is also recommended.

STANDARD OPERATING PROCEDURES

Digital imaging tools, such as digital cameras, and image handling software, can be important assets to the Fire scene investigator. But as with any other tool, there must be Standard Operating Procedures "S.O.Ps" in place to ensure that courts of law will accept the evidence gathered and presented.

Developing Standard Operating Procedures (S.O.Ps), or General Orders on the use of digital imaging.

These should include

When digital imaging is to be used.

Image enhancement

Training.

Release and availability of digital images.

The S.O.Ps should not apply just to digital, but should also include film-based and video applications as well.

Any action that has the potential to alter, damage, or destroy any

aspect of original evidence must be performed by qualified persons in a forensically sound manner.

Evidence has value only if it can be shown to be accurate, reliable, and controlled.

Standard operating procedures, governing the use of digital imaging technology, need to incorporate at least these key elements.

S.O.Ps

1. Images must be recorded in an unalterable, archival form soon after the records are created.

A digital imaging technology that supports this requirement is now available *writable C.D.s* often called CD-Rs.

CD-Rs are CD-ROM discs that are formatted to allow images, text and video clips to be written to the discs using CD writers and read using standard CD-ROM computer drives.

CD-Rs are ideal for storing images or information about

evidence because they are a *non-erasable media*. Data can be appended to CD-Rs as long as sufficient space remains. However, it is not possible to remove or write over images that are already on the discs. CD-R images are created by permanently altering the disc's dye layer with a laser light beam. CD writers cannot undo previous laser marks on CD-Rs [unlike rewritable CDs or CD-RWs]

Some CDs have engraved serial numbers as well, which eliminates the possibility that altered discs might be substituted for originals. CD-Rs are being used today in law enforcement to archive images and to display them in court.

2. The images should include information regarding their creation.

This requirement is also supported by today's digital imaging technology. For example, some digital cameras generate a uniquely written data file each time an image is captured. The file records information such as the camera's make, model and serial number, camera settings, and the date and time the image was

captured, and when the image is saved. The data file can be stored as well.

The image and data should be written to CD-R soon after image capture and prior to any image enhancement.

Only then will an archival reference copy have been created.

3. The agency must control custody of all image records at all times.

This requirement ensures someone can testify about who had access to any images used to support testimony as evidence. There are a number of procedures that can be put into place to satisfy this requirement. For example, determine which computer or computers will be used for medium- or long-term storage of image files. Then password-protect sensitive computer files stored on those computers. Keep the computers and any archival media, such as CDs, in secure locations.

The use of unalterable media for storage, along with a separately managed index for each unit, helps ensure the integrity of information.

Procedures should also be established for the

management of any files stored temporarily on portable computers. For example, it may be required to specify how frequently those files will be removed from the portables and archived.

4. All agency personnel who prepare exhibits for court should be trained in digital image processing and should understand which images might require a special notation to show that the changes are not prejudicial.

Certain procedures or enhancing digital imaging files are equivalent to using basic darkroom techniques to enhance film images. They are applied generally to an entire image. Digital imaging software can, for example, be used to control the contrast of images or to enlarge them.

Other digital processing procedures are potentially more problematic. These are applied to certain parts of an image. For example, you can use software to "morph" an image of a person's face to show how the person would look if he or she was older or several pounds heavier. In these cases, it may

be necessary for the staff to document how the changes were made.

Special procedures should be established to support expert witnesses as they testify concerning any of these image processing techniques. In some cases, it would be advisable to implement image processing SOPs, using computer-based tools.

For example, it is possible to record the keystrokes used to perform a computer operation in a file called a "macro." When a macro is replayed, it will re-execute the keystrokes in their original sequence. This technique could be used to document how a particular image alteration was accomplished.

5. The agency must establish rigorous procedures for entering work-in-progress into proper file systems.

Digital technology can help agencies document how and when images were captured, processed or stored. However, additional procedures must be used to create a complete audit trail of how the computer files

have been managed. Uniquely identifiable, unalterable media can make this much easier.

Digital imaging technology has brought new tools to scene investigation. Today, digital images appear in courts with increasing frequency, and the uncertainty about how they may be used is dwindling. In fact, in some ways digital images may prove more secure than conventional images.

For example, using today's technology it is relatively easy to alter an image scanned from a roll of film, create a new roll that includes the phony image, and then replace the original with the altered roll. However, if you use writable CDs which come with embedded serial numbers, and if you record an index of disc contents along with their serial numbers as part of your standard operating procedures, it would be virtually impossible to replace originals with altered discs.

The key is to select technology carefully and to put standard operating procedures into place that are derived from an understanding of operational requirements and the technology.

AUTHENTICATION SOFTWARE [WATERMARKING]

Watermarking takes its name from the world of paper and ink. Currency has a watermark to prevent counterfeiting. Fine writing papers use watermarks to identify the manufacturer and build brand loyalty. A watermark is synonymous with quality and integrity. Digital watermarks are generally used for one of three purposes—data monitoring, copyright protection, and data authentication. Digital watermarking can be either visible or invisible to the viewer.

A visible watermark is primarily designed to display a copyright notice, telling the viewer who owns the image rights. An invisible watermark can also be used to assert a copyright, but it is designed to catch those persons who would try to infringe on the copyright by using the image without permission of the owner.

Watermarks can also be used to authenticate the integrity of an image. When used for this purpose, a software

program is used to calculate a unique number using the image data. To establish specific ownership of the image, an encryption key assigned to the owner of the image can be used to encrypt the unique number generated from the image. The encrypted number is then inserted, by various methods, into the image itself. If ownership is not important, then only the unencrypted value is used.

Though the actual techniques used are complex and vary from one manufacturer to another, the process of inserting this value into the image **alters the image data**.

Software tools such as Stirmark™ (Version 3.1) or unZign™ (Version 1) are specifically designed to scan images for watermarks and remove them.

Watermarking and encryption may seem like good answers for those who would question the integrity of an image.

When these processes change the original image data, however, answers to questions such as:

"Is this image in the same condition as when it was originally captured?" become clouded with doubt. Visible or not, the image was altered and, at the very least, every piece of software that touched that image is going to be subject to examination. A claim could be made that the enhancement process is valid, but because the image was contaminated by the watermarking or encryption process, any conclusions based upon a "contaminated" image are suspect. An affirmative defence against such a claim would have to show that the watermarking or encryption process did not affect the results obtained. To do that, it would be necessary to repeat the enhancement process on a "clean" version of the same image.

A comparison could then be made to determine whether the encryption or watermarking process influenced the results of the enhancement process.

Should it be determined that there is little or no influence, the next logical questions would be:

Is this result unique to this image or does it

hold true for any image? What is the error rate? Can this be calculated? In this scenario the availability of a clean version of the image in question was assumed. Where did it come from? It is unlikely that any system using encryption or watermarking is going to maintain a second copy.

Not only would this double storage space requirements, it would create difficulties if not impossibilities in the authentication and tracking of the second copy, which was not watermarked or encrypted.

Agencies contemplating the use of any system that will alter the original image, whether for authentication purposes or to save storage space, would be well advised to run tests.

At a minimum, testing should be done to determine any potential effects watermarking or any other alteration might have on enhancement processes. A sufficient number of tests should be run to determine whether there is a measurable error rate as a result of the alteration. In other words, can the same

image be consistently captured, processed by the system in question, and then enhanced, with the result being the same as those obtained from a "clean" image? If not, how often do the results differ? Why? What happens when the same series of tests are run on different images?

Is the error rate, if there is one, the same? Answers to these questions will go a long way toward building an affirmative defence in court, should the issues be raised.

An effective image-handling system should be able to track the chain of custody and ensure image integrity without having to alter original image data. Systems that rely on a watermark or similar process that alters image data as part of the authentication process open the door to a possible myriad of questions that will only confound and confuse the average juror.

SOME CAMERA SYSTEMS & METHODS OF STORING DIGITAL IMAGES.

The cameras were examined in terms of functions necessary for

current operations, and additional features, which may be required in the future.

Current features required

- 2,000 000 pixels minimum
- Affordable Price
- Ease of operation
- Dust and waterproof
- Available service and parts
- Confidence in the guarantee

Features possibly required in the future

- Able to write directly to Mini Disc
- Compatible with, or supplied with Authentication software

Note there are three types of storage systems available that would fill our requirements, these are:

- Watermarking [Authentication software]
- Direct to Mini Disc in the camera
- Downloaded and written [burnt] to Serial numbered writable CDs

EPSON

EPSON has introduced **Image Authentication Software** that operates within the camera. Images can be

authenticated via a small software program on a PC. All images with an EPSON camera with **IAS** installed will automatically be embedded with digital authorisation.

The computer connects by a serial port to an EPSON digital camera. Initially, the software is loaded once in the camera with an encrypted key added to each digital image. Operation of the system is invisible to the camera operator and is automatic. The computer compares the image loaded from the camera, to see if it has been altered. EPSON contends changing one single pixel will cause the image to fail authentication. This system works with Epson's Photo 850Z, PC 800, 750Z and 700. The original estimate by Epson indicated it would take 330 years to forge an image embedded with an IAS fingerprint. Newer EPSON web material however omits a time estimate to forge an image protected by the system.

This authentication system presents the latest technological advancement to address digital tampering.

This system is currently not available in Australia.

KODAK

Kodak offers a digital point and shoot camera system that relies on standard operating procedures (SOPS), unalterable media storage and a separately managed, index to address image integrity. Writable CDs should be used to store digital images. Those discs are to be non-erasable. Writable CDs are created by permanently altering the discs with a laser light beam. CD writers cannot delete laser marks.

CDs should have serial numbers to avoid claims of substituted discs. Kodak writable CDs have embedded serial numbers readable by machines and operators.

Strict custody over the image records is necessary. That would include a separately managed index. An audit trail of the captured images is also important. However, Kodak's system does not place a "fingerprint" on each photograph as EPSON does.

Use of this system would involve the use of a lockable, dedicated

filing system to store the Compact Discs.

SONY

Sony offer several alternative cameras which utilise Mini Compact Discs

[Mini Discs] as an alternative to the now common, memory card. These are point and shoot with all the features of other brand name cameras. These cameras transfer the image directly to a Mini Disc, creating an instant unalterable original copy, which may prove to be a viable alternative method of storing digital evidence, if the system proves to be cost effective.

CANON

Canon offer a top of the range SLR type camera which is perhaps a little over the top for our needs.

NIKON

Nikon offers a similar range to most other manufactures, though the prices are currently slightly higher.

COSTS OF CAMERAS

The following are all retail prices quoted at the time of enquiry

Kodak DC 4800

\$ 1239-3 million pixels

Kodak DC 3400 \$ 776
2million pixels

Kodak DC 5000 \$ 991
waterproof version of
DC 3400

Sony Cybershot DSC
P1 \$ 1699
3 million pixels

Sony Cybershot DSC
P50 \$ 999
2million pixels

Sony Mavica CD 200 \$
1963 -Direct to mini CD

Sony Mini Discs
\$ 10.00 per disc

Canon EOS D30 Digital
SLR \$ 5405 + lens
\$ 500-700 extra

Nikon Coolpix 880
\$ 1739-3million pixels

RECOMMENDATIONS

The M.F.B should-

1. Develop a set of Standard Operating Procedures for the use of Digital Imaging cameras. These procedures should reflect an understanding of the operational requirements and the use of current digital technology, particularly in relation to Fire Investigation.

2. Select a range of digital equipment to

become the standard throughout the Metropolitan Fire Brigade. This will facilitate the effective implementation of the S.O.Ps and the free exchange of information between the Zones.

3. Develop a common secure storage facility for all digital images

4. Develop a training program that:

- Ensure trainee's can competently use digital cameras and related equipment
- Reflect the aims and objectives of the S.O.Ps

5. Develop a group that will liaise and exchange information with other relevant agencies, in relation to the use and developments in digital technologies

6. Peer review of our S.O.Ps by other relevant agencies ie Forensics and Victoria Police Arson Squad should be sought.

In conclusion, it must be acknowledged again that the digital image is vulnerable to tampering, so may a traditional photographic print be scanned into a digital form, altered reprinted and rephotographed and a

new negative produced. Hence, an integral part of the recommendation is the security of the Digital Evidence. It is fundamental that the CD-Rs are adequately stored and secured,

**Our S.O.Ps
need to clearly
address these
issues.**

**EQUIPMENT
RECOMMENDATIONS**

Camera

As for the particular equipment recommended, at the time of writing this report the **Kodak DC 5000** seems to be the standout for our requirements,

For these reasons;

- 2,000 000 pixels
- Price \$ 991
- Large controls, for ease of use when wearing gloves
- Dust and waterproof [can be washed]
- Highly recommended by many retailers
- Authentication software is available fully fitted by Kodak .if required.

Storage System

Our current software used for downloading and then managing the images is, at this time sufficient for our needs. The use of serial numbered Writable

Compact Discs for the storage of an original image is highly recommended. With the image being downloaded and written to a writable C.D as soon as possible, the image is then able to be left on a computer as well for the Fire Investigator to use, without fear of loss or unintentional alteration occurring.

Note- that at the time of purchase, a close look at all the available models would be prudent, as the technology and pricing are constantly changing.

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TEAMWORK?

The Bureau of Alcohol, Tobacco & Firearms (ATF) decided in the early 1980's that the crime of 'arson' was out of control. Part of the problem related to 'arson for profit' schemes. The ATF took a two-fold approach:

1. They participated in the crafting of 'Arson Immunity Laws' that now exist in 50 U.S. states.
2. They decided that they would allow members of the IAAI to participate in training courses that would be conducted, in part by members of the ATF Academy, domiciled at the Federal Law Enforcement Training Centre in Glynnco, Georgia.

ATF knew that the 'motive' behind many arson for profit schemes was to get at the insurance money.

Since insurers were going to be investigating 'arsons' and their file "evidence" would be available via search warrant, why not do some training to ensure

that the quality of the file was "good"?

The 'Arson for Profit' School includes training in:

1. Interviewing techniques.
2. Fire Scene investigation techniques.
3. Visual Link Analysis 'charting'.
4. Case Management Techniques.
5. Serial profiling.

It was a leap of faith for a law enforcement agency to trust "insurance-types" into the fold to receive specific training that is consistent with that provided to their field agents. Since the beginning of the course, however, ATF has not had any problems with these kind of issues.

"Teamwork" in the US has taken on a new meaning. It does not mean that the police and insurance adjusters/investigators "team up"

on a fire investigation! It does mean, however, that they can team up when doing training initiatives.

There is a duty of both law enforcement and insurers to discharge their respective duties by acting in "good faith". Law enforcement enforces the criminal code. Insurers determine whether or not the loss is "excluded" or not on the basis that it's a fraudulent submission. The role of the insurance investigator is not to put people in jail.

At the end of the day we are all responsible and accountable for ensuring that arsonists do not profit from their misdeeds! Public policy must surely support this point of view.

Unfortunately, many police agencies do not view "crimes against property" to be a high priority. They do not support the specialized training that is required to put arsonists behind bars.

Part of the reason behind this might be reduced budgets that

require police departments to allocate funds to investigate 'major crimes'.

The bottom line, however, is that if there are not aggressive investigations of 'arson crimes' it begins to flourish. Arson is not always about 'bricks and mortar'... it can, unfortunately, result in loss of life.

'Arson for Profit Schemes' bring with them common characteristics:

1. They are devious, well-planned events.
2. The response time of fire brigades in municipalities is under 5 minutes. The arsonist does not want early discovery of the fire.

The goal of the arsonist is total, complete destruction of the premises to maximize recovery of insurance proceeds. To accomplish this goal, the arsonist "accelerates" the fire. This can be accomplished by multiple points of origin or choosing a fast acting ignitable

liquid. This act puts many people in danger (neighbours, passer-by's, fire discoverer, first police officers on scene, first fire crew on scene.)

3. The fire will usually be set between midnight and 4 a.m. The event will take place usually on a Saturday or Sunday. This is to limit the odds of early detection of the fire.
4. The arsonist will quite often delay the ignition of the fire by using a timing device (i.e. candles, timer, toaster etc.)
5. The accelerated fire, given today's combustibles, puts the fire discoverer and fire crew 'in' at risk to a 'flashover phenomenon'.

Given that these 'schemes' are well planned, this makes it more difficult for the investigator to amass enough evidence that can lead to a criminal court conviction.

This means everyone involved in the field of fire investigations must raise the bar on their professional training.

'Arson' is not a victimless crime! It is not just 'bricks and mortar' being damaged! It is a crime that must be treated seriously.

Glenn Gibson
CIP, CLA, CFIAA, CFE,
CFEI, CCFI

(Glenn Gibson was the lead speaker at the NSW Association Conference in August, 2001).

FINDINGS OF AN ARSON STUDY

A study in the U.S. by Ritchie and Huff of 283 arsonists showed that:

- 90% had a recorded mental disorder
- 64% were intoxicated at the scene of their crime
- 71% used an accelerant
- 52% had felonies
- 35% had made a suicide attempt before the time of the fire
- the motive in 37% of cases was revenge.

NEW SOUTH WALES NEWS

FEES

Members who have not yet renewed their membership for 2002 are reminded that payment of \$40 for the year is overdue. Please forward your fee to the Association (Address given on page 3).

STRIKE FORCE TORONTO

Resulting from the devastating bushfires that savaged many parts of N.S.W. over the Christmas New Year period the N.S.W. Police have established strike force TORONTO.

This strike force has been set up to target bushfire arsonists and consists of about thirty detectives, Police Forensic Services Group, Rural Fire Service Investigators and the NSW Fire Brigades Fire Investigation and Research Unit.

This high level of commitment and expertise will hopefully lead to some successful convictions and a decrease in this type of crime. Ross Brogan our IAAI Liaison Officer is the N.S.W. Fire Brigades liaison/investigator on the team, and committee member Richard Woods is there for the Rural Fire Service.

We wish them well and hopefully when it is all concluded Ross and Richard will be able to relate to us how an arson investigation of this magnitude is conducted and the lessons that have come from it.

INFORMATION DAYS

Our information and training sessions for the year are evolving. The dates so far are :-

MARCH 21st.

'COURT MATTERS'
Presented by DAVID
SAMUELS.

David has been a Coroner and is well qualified to present the topic. This presentation should benefit those having to give evidence in the various court systems. To add atmosphere to the event we plan to hold the talk in a court room at Glebe Coroners court.

MAY 27th.

TALK BY NEIL HANSON
"THE DREADFUL
JUDGEMENT" (TRUE
STORY OF THE GREAT
FIRE OF LONDON).

Neil will be in Australia for the Sydney Writers Festival and we are lucky to get him; he is a captivating speaker. Neil sheds fresh light on the long held belief that the fire started in a baker's shop in Pudding Lane.

The true motives he explores could be a lot more sinister. The venue is to be advised.

MAY ? CANBERRA
A.C.T.

Not all our members can get to Sydney. In an effort to decentralise our training we are organising a training day in Canberra. This session is still being put together and we will inform you of the details as soon as they are finalised.

July ? ONE DAY
WORKSHOP.

This will be a hands on live burn exercise with investigation of various room fires set to test / maintain your skills in cause and origin fire investigation.

To enable us to cater for numbers those of you interested in attending any of the sessions please E-Mail either myself or Secretary: Norm Hewins. The E-Mail address and phone No. is on page three of this "Firepoint" magazine.

That will then give us your E-Mail address so we can send you final details.

Those without E-Mail please ring. Till next time, take care.

Don Walshe.
NSW AFI President

The NSW Bushfires

On 31 December, 2001, the following message, forwarded to all IAAI Chapters, was received:

Australian Brush Fires

As many of you know from media reports, our friends in New South Wales have been experiencing tremendous wild fires which have inflicted terrible damages. The NSW Fire Brigade assisted by units from Victoria are courageously fighting those fires. Some of the fires were intentionally set.

(Editor's Note: The assistance from other states, including Queensland, and from the Rural Fire Brigades and other agencies, was also greatly appreciated).

We have active chapters in New South Wales and Victoria. Our IAAI Liaison to Australia is Ross Brogan who is a member of the NSW Fire Brigade. We encourage all of our chapters to assist New South Wales in an appropriate manner.

It should be remembered that Australia assisted our country during the wild fires in the western United States earlier this year. They were also one of the first of the chapters to express their condolences and financial support to the terrorist victims.

Please add prayers and send any support you deem warranted. The IAAI sends its best wishes and pledge of support.

*Best regards
Michael A. Schlatman
IAAI Chapters
Committee Chairman*

Ross Brogan received the following message several days later:

We have been watching news reports of the fires you are fighting. On behalf of our Chapter's directors and our membership we offer our prayers and support that you will be successful in stopping these fires without injury or loss of life to any of your teams. If we can offer anything to you or your members please don't hesitate to ask.

*Dan Little
President
IAAI Ontario Chapter
Canada*

Arsonists Don't Light Every Fire

(from the "Sydney Morning Herald").

Much has been made of arsonists in the bushfire emergency, but there are many ways other than lightning strikes that can lead to flame erupting.

Rural Fire Chief Phil Koperberg has been careful to make the distinction between accidental, human-caused fires, and those lit deliberately.

CSIRO bushfire researcher Phil Cheney says there have been a lot of roadside fires, which may be arson or may have been sparked by less obvious sources such as "small clumps of carbon blown out of dirty mufflers".

Also, the catalytic converter on a vehicle can get so hot it will ignite grass underneath. Any metal striking rock will cause sparks.

If a fire is hot enough and winds are strong, a burning firebrand can travel up to 20 km to start a new blaze. That was how the fire "leapt" Warragamba dam.

Accelerant Detection Canines

*Val Ansett
NSW Fire Brigades*

Canines have been used around the world for the past 17 years to detect residues of ignitable liquids at fire scenes. This concept initially began as a trial between the Connecticut State Police and the Bureau of Alcohol, Tobacco and Firearms (BATF) in 1986, but quickly grew in popularity until now it is estimated there are over 200 Accelerant Detection Canine (ADC) teams in the US alone, plus many other teams in countries including Australia, the United Kingdom, and New Zealand.

In Australia, the New South Wales Fire Brigades (NSWFB) commenced training a black Labrador named Kova in 1996. This program was initiated with Ministerial approval and was seen as a positive deterrent to arsonists as well as a tool for investigators. Kova was donated by the Australian Customs Service (ACS) and was trained in a joint effort by the NSW Police Service, ACS and the NSWFB.

In 2000 Kova was retired as a pet and a new Labrador named Ellie was donated to the NSWFB by the ACS. Ellie had been trained as a narcotic detection canine but easily took to the new training and target odours. Currently Ellie is responded to fire scenes by the NSWFB Fire Investigators and Inspectors to assist in their fire cause and origin determination, but can also be asked to attend by other services. Ellie works at approximately 100 fire scenes a year.

To better understand the abilities of the Canine, a joint project was instigated to determine the detection limits, reliability, which chemical components triggered a response, and canine health aspects with Dr Eric Du Pasquier from the University of Technology, Sydney (UTS). These results are available to interested persons.

As with any new technology, ADC's have received both negative and positive publicity, and have been used as well as misused in many situations. It is important for readers to

understand both the potential of ADC's, and the limitations that may affect them.

ADC's can drastically reduce both the number of samples needed to be taken at a scene, as well as the time required to excavate a large scene. It is imperative that it is understood that the canine does not remove the necessity of a methodical investigation, rather it is a tool to assist in the location of ignitable liquids.

ADC's can also be used to locate discarded fuel containers; confirm sterility of sampling equipment; confirm samples taken are 'positive'; indicate if there are odours on clothing, and help rule out the use of ignitable liquids at a scene.

The indication by an ADC that there is an ignitable liquid present is purely that - an indication. A sample must always be taken and analysed to confirm the indication. It is a definite misuse of the ADC to think that its indication is proof enough. Obviously, the presence of an ignitable liquid does not in any

way show intent, but can assist the investigation.

Recently there have been concerns raised in various publications regarding possible adverse aspects of ADC use. These have centred around negative health effects for the canine and contamination issues related to running the ADC through the fire scene. To date there have been no reported health effects from canines working fire scene. The joint project with UTS assessed Ellie's health over a nine month period and found no ill effects to her lungs or blood. The handler always has the final say as to whether the scene is suitable for the ADC, and when the canine no longer finds fire scenes enjoyable, they simply don't work and are retired as pets.

The issue of contamination by ADC's at a fire scene can also be levelled at any person within the scene. If anything, the canine reduces the risk of contamination by quickly indicating if and where an odour is present, allowing a sample to be taken before anyone further disturbs the

scene and also by locating discarded containers that could otherwise be completely overlooked by investigators. As long as appropriate cleaning methods are undertaken between scenes as one does with all equipment, this is not an issue.

Should you ever need the assistance of the ADC, or require further information please call:

Val Ansett
Canine Handler/Trainer
Fire Investigation and
Research Unit, NSWFB
Phone: 9742 7107
Fax: 9742 7385
e-mail:
val.ansett@nswfire.nsw.gov.au

VICTORIAN NEWS

PRESENTATION

On the 5th December, the Chapter presented a session at the MFESB Training College in Abbotsford with presenters Mike McCumisky and Russell Lee on "ELECTRICAL INVESTIGATION". This was well attended and provided an insight into the electrical world. Thanks to the MFESB

for the use of their facilities and to the two presenters.

MEMBERSHIP

Although the December / January period is usually quiet, the committee has approved a further 13 new members to the Chapter being Darren Hay, Keith Robertson, Peter O'Keefe, John Marshall, Michelle McKay, Chris Day, Tony Milcakowsky, Warren Goodrich, Robert Barry, Geoff Razenhoffer, Mark Glover, Peter Ray and Geoff Gray. Welcome to all. It is important that all members ensure that they have paid the 2001/2002 fees as a review of membership will be undertaken in March. If you're not sure contact Bob Hetherington

TRAINING SESSIONS

The Chapter Committee is working towards several sessions starting in March and a major seminar in August. All members will be notified as sessions are organized. If any member has an interest or any requests and /or can assist in running a session please contact one of the committee.