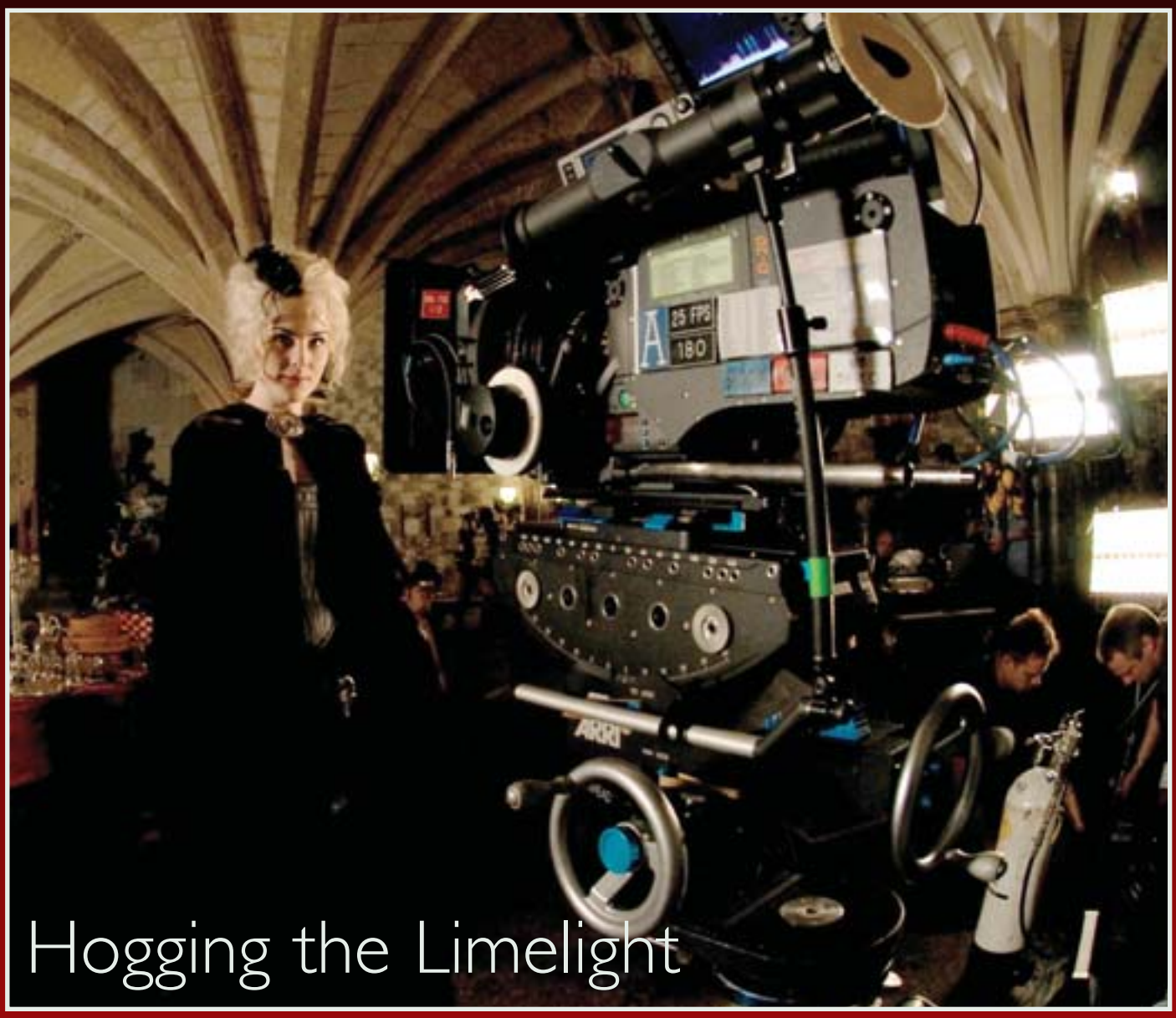
Zerb

Guild of Television Cameramen
Issue 65 • Spring 2007



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Editorial

Another year gone and, if you were fortunate enough to see the New Year fireworks in London on BBC HD or BBC 1, it did go out with a bang. But how was it for you? If, like me, you subscribe to the GTC forum, you can't help but get the impression it was one of mixed fortunes. Some names keep popping up and seem very busy; others, alas, not.

On the camerawork front, I admit to having only two jobs in 2007, albeit commercials and at least in HD. But the lighting work has kept me very busy, so having my own kit would not have helped this year, and with anything from a Croc Clip to an HD Camera available to rent, and the BBC HD open day speakers saying don't buy anything for the moment, why have your own kit anyway?

Those on the forum that are busy do seem to have their own kit. But what kit? Where do you start? Surprisingly, perhaps, maybe not with the camera. We regrettably saw a slide downwards, in my view, to DVCAM, leaving some DigiBeta owners high and dry. Meanwhile, Beta SX, domain of the news organisations seems to be in limbo.

With HD I think you would have to be very certain of future work that pays enough to cover the cost of investing in that fast moving technology.

There's always prosumer HDV?... hmmmmm!

And then we have XDCam, the Grass Valley Infinity range, and the other tapeless formats. If I were in the market, I think a camera would be my last choice. So, looking at the situation from another point of view, why not diversify? The industry, like it or not, is changing. But, are you? A very excellent cameraman I know is now doing a lot of comms work, another is editing, and another has bought a dolly and some grip equipment and is now working all the time, but hasn't done any camera operating for years.

why not diversify? The industry, like it or not, is changing. But, are you?

I often get asked what does a cameraman do? A decade ago it was a relatively easy question to answer, but now with cranes, jibs, Steadicam, location sound, post production on a PC, and lighting, it is not so easy.

I started off in 2006 wanting this issue to feature articles on lighting, but half way through thought 'hang on, quite a lot of cameramen never get to touch a light'. Then, after reading a training magazine that featured this industry, thought more about the things a cameraman could get involved with. So, this issue is diverse! So, this issue is diverse ! I often hear talk of HD cameras seeming less sensitive than SD, Ged Yeates mentions this point in his review of the XDCam, even at the Pro-sumer end, the Sony Z1 is less sensitive than the PD150, well Alan Bermingham's article on HD vs SD sensitivity will explain why they are, indeed different. John Keedwell has served us well and his fascinating article on High Speed video is living proof of diversification.

John Adderley and his piece on motion control adds many new disciplines to the table and is definitely food for thought. Ged Yeates is brave enough to venture onto new camera ground and his comprehensive review of the XDCam HD is going to be a compulsive read for the avid (pardon the pun) cameraman.

Tony Grant, as ever is going to get us out of trouble with his very witty approach to lighting when there isn't any. Thanks Tony, you're a star. I have tried to offer a helping hand to that thorny problem of windows, not the Microsoft ones but those bl**dy ones that always get in shot when they are not wanted. If you want controversy then I think Peter Eveson will be a must see in that department.

If you want to read about something that's nothing to do with cameras, then I have one of those too. Lucy Woodward, whose many talents include being a freelance VT engineer, who really does own every known format of VTR from 1/2-inch to 2-inch, yes really, has a business copying old videotapes, some dating back to 405 line days. There is much more and I know you should have a good read with some fabulous pictures too – keep them coming, I know the editors appreciate them. Finally, my thanks to Christina Fox, without whose help there would not be a Spring edition. If she asks you to edit an issue I truly advise you to say, YES. Thanks Christina and thanks to the membership, for reading this, you can send money, but I would prefer you spent it on yourself and a little diversity thinking.

Peter Eveson shooting in Strasbourg for ITV drama A Quiet Conspiracy

Dramatic effect

By Peter Eveson

"Allowing them to continue to do this on an HD shoot can be very dangerous indeed," warned film DoP Paul Wheeler, in the Spring 2003 edition of *Zerb*. What is this danger and how can it be remedied? Surely a risk assessment would help to minimise this hazard, it obviously shouldn't be allowed.

In it Paul stated that the 'danger' was the seemingly heinous crime of allowing a TV trained and experienced cameraman, to pull his own focus on an HD drama shoot. To me, and to a number of my studio crew who read the article, it was insulting and seemed to present an HD drama world in which the skills developed over many years by TV cameramen had no place in the new scheme of things. Paul went on to state,

"....focus pulling difficulties become the same as on 35mm film and a fully trained and experienced focus puller becomes essential."

Essential to Paul perhaps, but what about the vastly experienced TV cameraman who has spent the whole of his working life operating on complex TV dramas and pulling focus successfully. Shouldn't their skill-base be given, at the very least, a chance too in the HD market?

The obvious conclusion, from Paul's article was NO, and that film-based crews should inherit HD drama and not TV crews who had been working on PSC video drama for decades.

But, wait a minute, the new scheme of things looked suspiciously like the old film-style crewing that has existed for years. The only difference is the camera and recording medium. It isn't film. But, if you put the frighteners on producers and directors not to use TV techniques (and cameramen) then...bingo, you have it; video HD drama staffed by film crews!

In subsequent editions of *Zerb*, this film-biased viewpoint has been promoted as the way to go on HD, culminating in, "...it is actually easier to take people from the film industry into HD than it is from the television industry." (Brian Rose, *Zerb* Autumn 2006).

Well, with film-based kit bolted onto what is basically a TV camera, that would be the case. But, TV cameramen, producers and directors should note, it is not the only way of shooting HD drama.

With those *Zerb* articles in mind, I leapt at the chance to work on two HD 'film' projects being produced by Norfolk-based Capriol Films. I wanted to see and experience for myself the dangers of HD shooting and to give it my best shot.

Phil Bishop is well known as the BBC producer from *Top Of The Pops* and *Jim'll Fix It*, he needed a TV cameraman to DoP and operate on his two latest 90-minute projects. He'd known me since the 1970s and because of my drama background, wanted me to... danger... danger... focus pull too.

Warlock wizardry

He introduced me to the director and writer, Tony Britten, who

Mark Dexter, Maime McCoy, Lucy Brown and Georgina Rich in Peter Warlock – Some Little Joy

Falstaff set in pub

Camera rigged and ready to go

explained that the first film was a contemporary version of Verdi's opera *Falstaff* set in a modern golf club. The second was a period drama, set in the 1920s, about the life and loves of the composer Peter Warlock. It was to be entitled: *Peter Warlock – Some Little Joy*, and actor Mark Dexter would take the title role with Lucy Brown as his lover Barbera Peache. Just before we started shooting, Phil was pulled away to another job and producer Averill Brennan *(Foyle's War, The Swap, Extremely Dangerous*) stepped in to oversee the shoot.

I wanted the Sony HD750 to be configured in TV as opposed to film-style operational mode. This meant a large Sony monochrome CRT viewfinder fitted with a 1.5 dioptre magnifier and operator focus-module using a Canon Bowden cable attachment. The magnifier made the viewfinder image half as big again, to enable precise operator focusing.

I developed the 'sharp shooter' lens, as I call it, when faced with a similar, small Ikegami HL55 viewfinder, which I was using on a number of single-camera Anglia TV dramas. I focused my way through 23 episodes of *The Chief* police series for ITV using that magnifier which was then adapted to fit on any OB or studio camera viewfinder, clamping by means of two croc clips. It was referred to, by *The Chief* drama director A J Quinn, as the undersea world. (If you remember back to the days of the Marconi Mk 3, four-and-a-half inch IO camera, it too had a magnifying lens over what was a pretty small viewfinder.)

Equipment for the projects was sourced via Anglia TV in Norwich.

The Sony HD 750 was provided

The new scheme of things looked suspiciously like the old film-style crewing that has existed for years

Georgina Rich and Mark Dexter

Peter Eveson and Angelina Thomas with Ikegami HL55 on set of ITV drama The Chief

The sharp shooter lens

Peter with the HD 750

with BBC spec 35mm film settings shooting 1080i/25p. Andy Quested, from the BBC's HD department, provided help and information to the production concerning the BBC camera settings.

Focal lengths were quickly set using a Canon zoom demand and only two lenses were hired for the shoots; a Canon HJ 21x tele and a Canon HJ 11x wide, (both lenses in TV mode with x2 extenders). A back-end acrylic filter, developed at Anglia, was also used on the period piece for all interior scenes.

Those lenses were chosen because of their range, size and quality at wide apertures. In order to give the projects a filmic quality, which was the director's required look. Apart from the settings, most shots were obtained with the lenses wide open to get the maximum differential focus.

There were long telephoto shots on the HJ21, with large focus pulls throughout. On *Falstaff* some of the shots were over a minute in duration with complicated shot development. Luckily, I've managed to hone up the focusing skills on live OBs, operating 70:1 lenses, on football matches of all things.

Smoke-filled rooms

Peter Warlock's main interests were women and beer, so smoke-filled, gas and candle-lit pubs gave an added visual flavour to the pictures, which the filter really picked up. I also used a softened camera top-light on all shots involving artistes, to gently add in eye-lights, which I remember worked so well on early BBC 70s' dramas when every camera in the studio had a set of headlights that were controlled by the lighting director. Other shots were tripod or Steadicam . There was always a CRT HD monitor to view for lighting set ups and production monitoring.

An additional little task, because of budget limitations, was to perform all camera movement and tracking shots with another piece of TV gear, the Vinten Dolphin arm.

I used almost exactly the same rig in 1988 (see photo) on ITV's *A Quiet Conspiracy*, starring Joss Ackland. The main difference was that the camera then was plumbed into a mini OB. Framing, focusing and ped operation is a very good background to have when faced with this sort of operational requirement on HD and a very cost-effective skill to have up one's sleeve.

We did have tracks for one of the shots. But, I have to admit the tracks were laid in the 1860s and we made use of them for a shot along a railway station in Norfolk. It was like a scene from Dad's Army, with all the able-bodied pushing the bogie.

Tony Britten, the Executive Producer of Capriol Films, admits that: "In an ideal world it would have been great to have had the benefit of grips and tracks, but if the budget is tight then high-end HD is still possible using these tried and tested techniques." He believes that: "Many of the shots, considering how they were achieved, were equal to shots obtained by film-style crews operating HD. But, at remarkable value, with thousands saved. Without the TV camera mode of operation and [given] the complexity of the scenes, we would not have had such a fast shooting rate. The two films were shot in six five-day weeks."

Both films were edited by Jeremy Brettingham at East-North-East, while Alan Bishop of Martyr TV graded the final edits. All other post production work was done at Anglia. Falstaff has already had an airing on Sky's Artsworld.

I've recently been working on the new ITV drama *Kingdom*, with Stephen Fry, where both shooting styles were used. We had Pro 35 primes on one camera with the DoP and a Canon HJ lens on the one I was using.

I do hope that my observations on these HD projects will clear the way for the two types of HD filming to coexist and thrive, with their respective skill bases working for the production and ultimately the viewer. It doesn't matter if HD images are produced with TV techniques or film, as long as they are good and fulfil the remit. They are both valid and have track records to prove it.

Fact File

Peter Eveson has been a TV cameraman since 1969 when he joined the BBC. He has worked on the full range of BBC and ITV dramas and other programmes since that time (*Onedin Line, Doomwatch, Lotus Eaters, Tales of the Unexpected, P D James Murders,* and *The Chief* series). He works on studio, OBs and PSC productions.

He was awarded a Guild Certificate of Merit for his camerawork on the ITV Drama series *The Chief* starring Martin Shaw.

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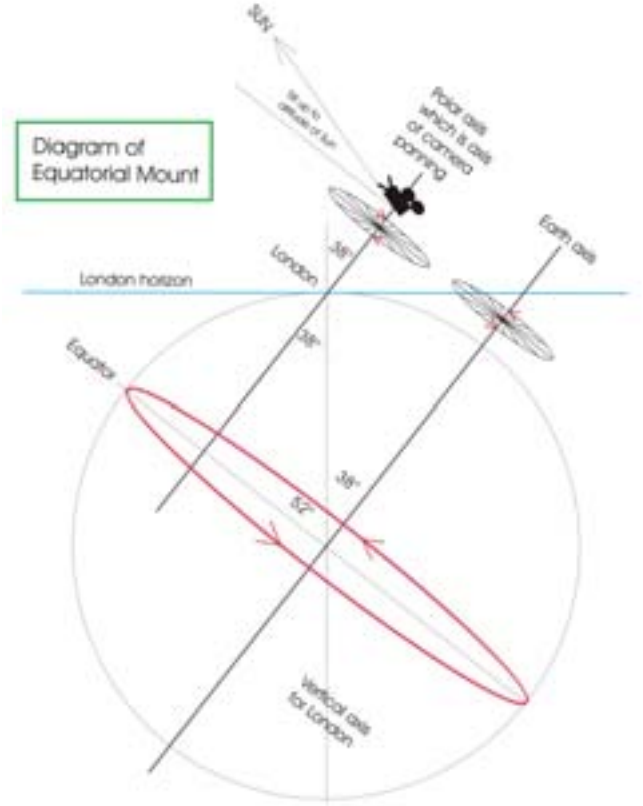
Here comes the Sun

By John Adderley

Having worked now for a long time with many film artists and non-broadcast filmmakers, my skills with unusual and different film formats shooting motion control and timelapse have become widely known. This is why Alix Poscharsky, a film artist, called me to shoot her project.



Her brief was to show the relationship between mankind, the sun and the Earth in a different way than we usually think of them. The idea was to lock the camera on to the sun during sunset, as the Earth eclipses the view in its daily rotation. That way Earth would appear to be moving across the frame while the sun remains fixed in the middle of the shot.

Alix wanted to create a cinematic feel, like a scene from a science fiction film. The film is about the nature of scientific knowledge, about seeing and believing.

To achieve this, Alix came up with the perfect location at Greenwich overlooking London from high on a hill.

We proposed the camera, running at timelapse speed, would be locked on to a frame with the sun in the middle and as the Earth came into view the scene would be gradually recognised as the skyline of London. My motion control kit has three channels of movement – pan, tilt and track. By tilting the rotational axis of the head over to 38 degrees it rotates in an axis parallel with the Earth's axis. We did not need to track.

A good sunny day with a bit of cloud to make a good sunset at an excellent location for a huge backlit panorama of London

An equatorial mount, as shown in the diagram, is used by astronomers for telescopes. When the camera is in equatorial mount configuration I only have to use the pan motor, after using the tilt just to elevate the lens to the ecliptic. (The ecliptic is the apparent path the sun traces out along the sky – independent of Earth's rotation.)

My motion control is a ten-inch Moy head with Vexta micro stepping motors, which are driven through micro stepping cards by software called Timeline, designed partly by myself and written by Mo-Sys.

This gives me extremely fine control of the pan and tilt. It is

The composite digital camera recce shot to help us plot the various bearings of the major landmarks

graduated in degrees. I can set it to run at a speed of 15 degrees per hour so it can keep the sun in the middle of the frame. We decided that the best format to use would be anamorphic 16mm with sideways tilt of the camera just a bit further than the plane of the ecliptic. The choice of camera was an Éclair ACL.

Alix wanted to run the shot, tracking the sun from 2.5 hours before sunset to 2.5 hrs after. The showing length was to be about eight minutes so for five hours tracking we shot one frame at a 1.8 second interval. The exposure time set on the stepper motor was 0.14 sec (about 1/7th sec).

The stepper motor can be set to ramp up to speed for each frame at a predefined rate so as not to jar the mechanism too much. The ramp up occurs before the shutter starts to expose the frame and ramp down after the frame is closed.

Anamorphic 16mm has a standard 16mm gate in combination with the normal anamorphic lenses as used with 35mm film cameras. The picture is optically squeezed horizontally to half to fit the 4:3 frame. When expanded for projection the picture retains the vertical angle of the taking lens, but achieves double the horizontal angle. This gave an aspect ratio of 2.35:1.

An Éclair ACL has a very good universal lens mount that can adapt to PL, BNCR, Arri, C-mount and Cameflex. It also has a focal plane shutter, which closes the aperture plate completely between shots and allows long interval times without light leak.

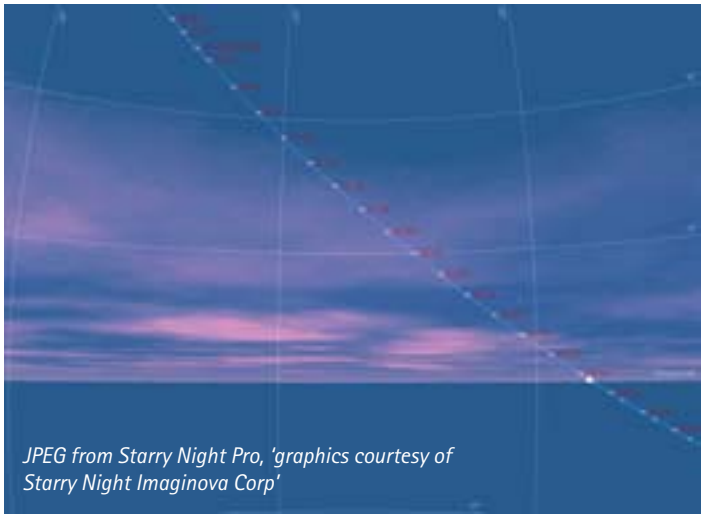
There were issues, though, with running the camera on its side in timelapse mode. The roll tends to

take up and drop towards the door and could stop taking up if the magazine is old and the runners are not smooth enough.

We recced the shot in 2005, when I took a GPS reading and photographs to identify all the bearings of the landmarks. I then brought all this data back to base and used three main computer programs to set it all up: Garmin Mapsource, Starry Night Pro and Photoshop.

With Garmin Mapsource digital maps of London I was able to identify landmarks and find their bearings from the location.

Alix and I then had to decide where we would like to see the sun set in London. That choice, of course, would set the date of the shoot. We decided that the best place would be approximately St Paul's with its easily identified



JPEG from Starry Night Pro, 'graphics courtesy of Starry Night Imaginova Corp'

dome.

I then used Starry Night Pro to run the sun through several months of setting and we came up with the week of 22 May 2006 when the sun sets at an azimuth close 306 degrees. Starry Night Pro is an excellent tool for this as you can set it for any latitude-longitude and animate the sky at any rate at given dates and times. It can be made to show the track of the sun with time stamps as it travels across the sky.

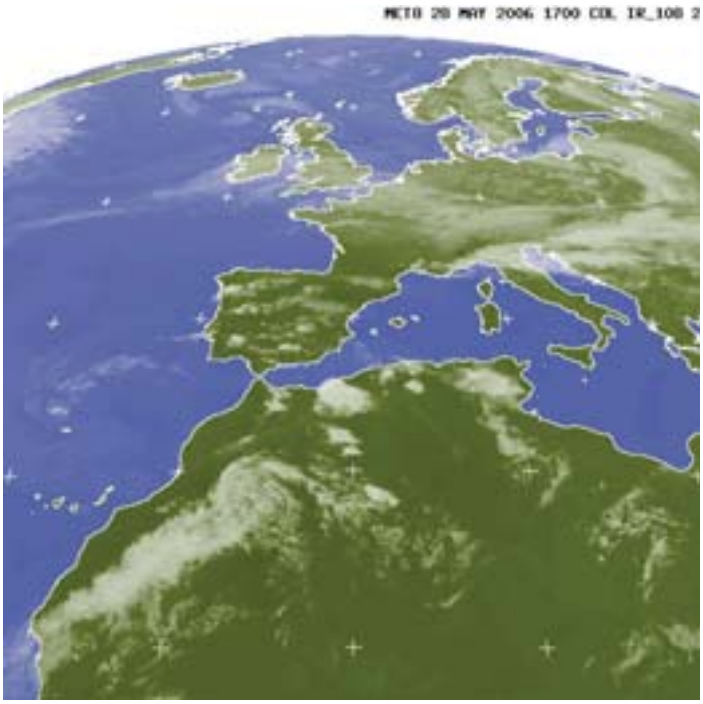
This track can then be exported as a JPEG and superimposed over my recce photos in several of the Adobe graphics programmes as long as it works with layers. Starry Night Pro can be made to show the azimuth/altitude grid so the sun track can be scaled freehand on to the recce photo with the bearings marked.

I then took the 16mm ACL with the anamorphic lenses to the location to assess which lens we wanted to use. I took digital photos through the viewfinder of the 25mm and 35mm lenses and expanded them later in Photoshop to scale them to match the recce photo and the sun track. Then I turned the two superimposed lenses and moving each on a different layer. I could turn the frame and run it through the shot we needed. We had a little problem with a tree in the foreground, which really forced the issue of the choice of the 35mm size. That turned out to be the best choice because although the landmarks could not be recognised immediately they could be recognised after the shot had started to mature.

We then waited until May 2006

Digital camera shot of viewfinder with image doubled horizontally. The lens was a 35mm focal length Russian Lomo anamorphic

Wide shot of London panorama showing the path of the Sun superimposed and the two lens sizes 35mm and 25mm. The two lenses are on different layers and can be moved individually. With transparency this gives a good mock up of the final shot



www.eumetsat.int image – showing approaching weather. An excellent tool for cameramen as a forecasting device. These images are downloadable and can be seen sequentially as an animation of the immediate past day up to an hour before. © 2006 EUMETSAT

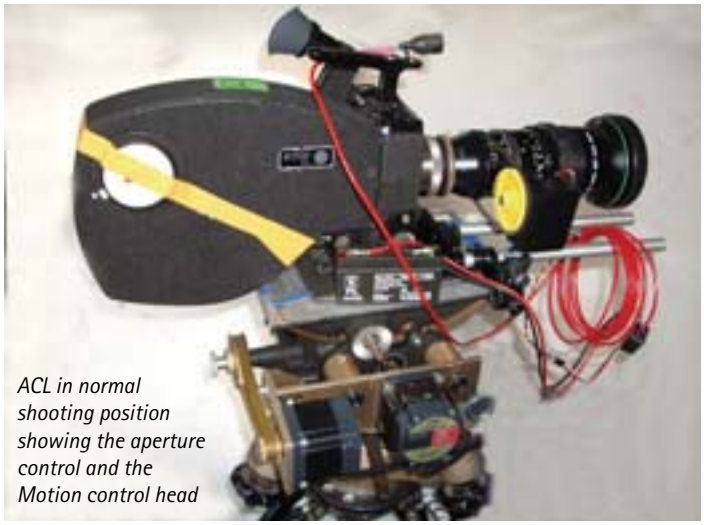
and started watching the satellite images on *www.eumetsat.int* to get an idea of the weather patterns. Watching these sites, combined with *www.metcheck.com* and BBC weather, for a couple of weeks can get you finely tuned to the weather. This enables a good guess as to the right day to shoot. The weather leading up to the shoot day of 28 May was terrible but this, combined with shooting on a Sunday, meant that the air pollution was low. The best weather would have been clear with slow moving cumulus clouds so as to give a good movement in timelapse.

I built a new stepper motor on to my ACL and I fabricated some electronics to stop the shutter at exactly the same place each exposure. This motor has a programmable chip that can be addressed through the serial port. The sequence for turning the shutter and the interval and exposure times are made on a PC or a PDA. The sequence is then written to the chip via a serial link after which the computer is disconnected and the motor set in autonomous motion with a switch.

I am working with the manufacturers of this stepper motor and controller at the moment. They are writing some control software so the timelapse camera can be controlled directly from the iPaq PDA. We are planning to have the exposure times directly controlled by a photo electric cell so that light changes, as in a sunset, can be tracked into night and times ramped to give gradually increasing extended night exposures.

I have this arrangement now on my Mitchell S35 but the exposures and intervals are regulated through software I wrote on a Psion. The shutter angle and aperture are regulated by a photoelectric cell and servo motors. The results of this can be seen on a 24-hour motion control timelapse at *http://www.timelapse.me.uk*. I have a camera engineer at the moment working on a design for this motor so it can be fitted to an ACL and a Cameflex. Using an Ipaq means that I can be totally free of mains because of such low power consumption.

With the lens looking straight into the sun for such a long time it's important that the flare looks good. The quality of the glass and design of the optics in the Russian lenses are very high so the images were good. I started with the aperture at T22 and as the sun set I had my own fabricated aperture control take over the stop ring. I used a model aeroplane servo motor hooked up to a photoelectric cell via a little electronic circuit with a 555 chip. The photo electric cell is on a long flexible lead so I can point it at something that is lit by the ambient light and does not change when passing clouds cross the sun.



ACL in normal shooting position showing the aperture control and the Motion control head

With a sunset, it is best to use a machine to track the exposure change because the change is not linear. The exposure change required for this shot is very great and should really have involved another method of control, such as on my Mitchell, with variable

Two frame grads from the final film showing the aspect ratio and the sun's flare

shutter angle and variable exposure time. With the forthcoming changes in the software for my stepper motor on the ACL this feature will be available. It will be changed as a function of time and command or under the control of a light cell.

We used Kodak Vision 2 50D 7201. After processing, we had a graded print made for the best exposure at the time of sunset. Since it is not possible to change the light as the printing takes place, the whole shot is over exposed at the front and under exposed at the end. The sunset was just perfectly exposed.

We also did a transfer with the Shadow Telecine using a dynamic grade. This was much better for exposure all the way through. It can be seen at *http://www.adderley cine.net*. This shows that there was latitude on the negative for such a wide exposure change if the printing could be adjusted gradually throughout the shot.

Film would always be my first choice of capture medium for timelapse because it has such a wide latitude. A good colourist can do wonders in a good teleciné.

We managed to pick the right day on 28 May 2006. It was fine, with light altostratus cloud, which gave quite a good sunset. A slight mistiness across the city was beautifully accentuated by the backlight and the change from daylight to dark when the city lights switch on was very beautiful.

I had to build the mount up on three other tripods to get the view clear of foreground shrubs for a clear view for the camera on its equatorial mount. I achieved the tilt angle with a combination of very good military laser sight tripod and a Moy three-way leveller.

This was the combination I used to track the Transit of Venus in 2004 with the S35 Mitchell shooting timelapse with a 1200mm lens. Getting track accuracy for the sun path with such a narrow angle lens took me several hours. I managed that on the day previous to the transit, adjusting with the three-way leveller.

To be accurate, the axis of panning should be pointing at the north celestial pole. With the much wider lens on this shot the accuracy of the rig was less critical. It was sufficiently accurate to use Canary Wharf as a reference point for north from that location and a digital level shows the degree of tilt.

For the showing of the film we used a normal 16mm projector with an anamorphic attachment. On its first showing in a small cinema theatre at Central St Martins School of Art, it was admired by many people. I think it is best shown in a gallery in a darkened room where people can walk in and out when they like and the film shown on a continuous loop. This should stimulate watchers to ponder on the wonders of time and space without there having to be a narrative. This is the same method of showing films I shoot for Tacita Dean, one called Disappearance at Sea is on permanent display at Tate Modern.

At the end of the project, Alix felt that we had achieved our objective. It was a good coordination of all that technology in the face of the certainty of the physics and against the whims of nature. Feedback from viewers showed it had stimulated the thoughts that we had hoped they would realise – a different view of our relationship with the natural world.

Fact File

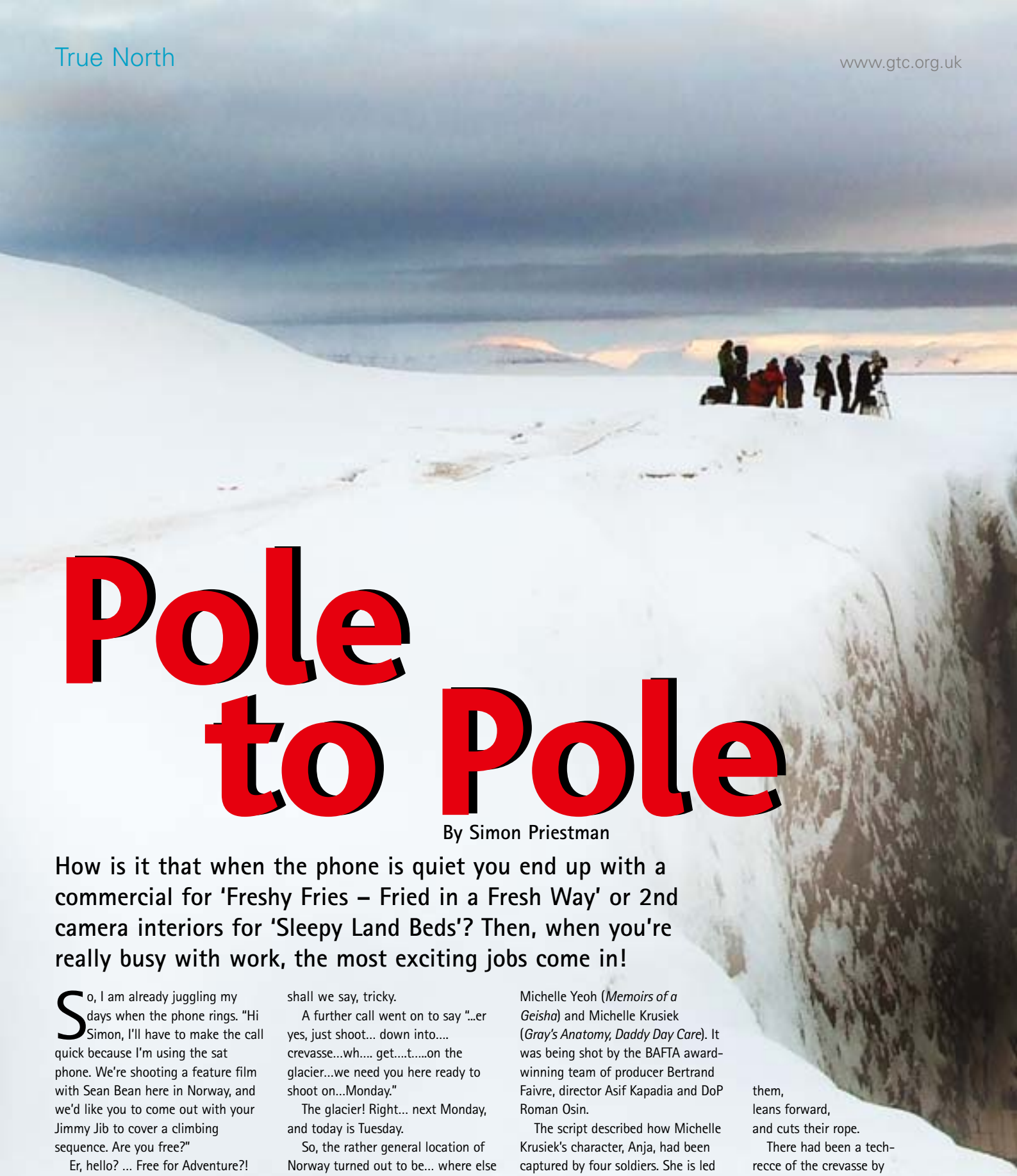
John Adderley – Lighting cameraman and GTC member. An Australian in the UK since 1971, he was with the BBC Film Department for 23 years and has been freelance since 1995.

John works on all formats from DV to HDCAM and 8mm to 35mm. He shoots for TV, corporate films, pop promos, feature films and several international film artists including Tacita Dean. His work with Tacita received a Turner Prize nomination in 1998 for a film shot on anamorphic 16mm.
Contact: *john@adderley.net or www.adderley.net*

The review....

What makes a great artwork? Minimum ingredients, maximum taste. If you agree, you should see Alix Poscharsky's beautiful 16mm film: *As We All Know*. It is the best example of how one simple idea can create eight minutes of visual wonder. On an extra-long panorama screen, imagine a prism of white bright light, there, suddenly. Then something dark starts pushing in from the right. Gradually the light diminishes turning into a stunning red. What is this? Half the way into the film the penny drops: it's a sunset filmed from the wrong angle! Poscharsky is tricking my perception with a simple twist!

Minimum ingredients, maximum taste. It is all there: abstraction, nature and the sublime. But this film is also – dare I say – narrative. The process of the sunset (once you got that's what it is) creates a suspense, which keeps you in the seat from the first second to the last. Poscharsky's work reminds me of 70s' structural film, because it uses minimal techniques, it portrays a gradual process, and deals with the basics of film: light. Amongst the countless bland, 'what's your point' graduation videos, *As We All Know* is my bright star at the horizon. (Maxa Zoller, 2006).



Pole to Pole

By Simon Priestman

How is it that when the phone is quiet you end up with a commercial for 'Freshy Fries – Fried in a Fresh Way' or 2nd camera interiors for 'Sleepy Land Beds'? Then, when you're really busy with work, the most exciting jobs come in!

So, I am already juggling my days when the phone rings. "Hi Simon, I'll have to make the call quick because I'm using the sat phone. We're shooting a feature film with Sean Bean here in Norway, and we'd like you to come out with your Jimmy Jib to cover a climbing sequence. Are you free?"

Er, hello? ... Free for Adventure?!

It seems due to this job's unusually isolated location, communications were proving to be more difficult than usual. Sat phone calls are definitely more frustrating than regular mobiles, as the caller's voice seems to drift in and out as if it's carried by the wind.

So, trying to glean information from the production office, which seemed to be based on a ship was, shall we say, tricky.

A further call went on to say "...er yes, just shoot... down into.... crevasse...wh.... get....t.....on the glacier...we need you here ready to shoot on...Monday."

The glacier! Right... next Monday, and today is Tuesday.

So, the rather general location of Norway turned out to be... where else but Svalbard!

OK, I'd not heard of it either, but it's 78 degrees north and well within the Arctic Circle and only one hour flying time from your actual North Pole.

It transpired this was to be a sequence for a new picture *True North*, a co-production with Freeze Frame, the PJB Picture Company and Channel 4 Films starring Sean Bean, Michelle Yeoh (*Memoirs of a Geisha*) and Michelle Krusiek (*Gray's Anatomy, Daddy Day Care*). It was being shot by the BAFTA award-winning team of producer Bertrand Faivre, director Asif Kapadia and DoP Roman Osin.

The script described how Michelle Krusiek's character, Anja, had been captured by four soldiers. She is led across a frozen glacier. Frost bitten and weary, the troop are tied to one another by a hemp rope. Anja sees her chance to escape, and cutting herself free, pulls the four disparate soldiers into a deep crevasse.

At the last second, the lead soldier manages to piton into the top of the crevasse with his ice axe, shouting and screaming, they all hang from this one fixture! Anja looks down on them,
leans forward,
and cuts their rope.

There had been a tech-recce of the crevasse by helicopter. The key grip, Rupert Lloyd-Parry, had suggested the best way of getting Anja's point of view and getting down the rope to see the actors struggling to survive. Perhaps they could use a Techno Crane or maybe a Jimmy Jib might just work.

For my part, having done previous work on snowfields, glaciers, up mountains and in generally difficult locations, I knew there were going to

Main picture: The Jimmy Jib on Svae, below left: Simon Priestman with the pulk, below right the Jib on the beach

be a number of issues that I had to immediately resolve: How cold is it? What's the surface of the glacier like? What's the access? Who's the safety officer? So many questions and no time! None of these questions really did get answered because it was so difficult to establish communications with the 'front line'. Everything was by sat phone or the occasional text message.

I decided to employ the good services of Simon Edwards as my jib assistant. Although not exactly a mountain man, Simon knows Jimmy Jibs really well. He is also very dependable in a crisis, not that we ever have a crisis you understand!

Simon and I immediately went to see those great people at Cotswold Outdoor in South Cerney to stock up on those essential glacial items like crampons, ice screws, hot gel packs for the batteries and sticks of toffee for us. I currently use the A&C Pee-Pod 500 remote head for my main Jimmy Jib. This three-axis head is beautifully engineered, rugged and very, very powerful, so is ideally suited to having a 35mm camera strapped to it. I drove to Harrow to see Frank Fletcher at A&C Ltd to have the head checked over and to sort a flight case for it.

Thankfully this meant that I established the head has been tested to minus 18 and should therefore stand up well in what would be autumn arctic conditions

Excess baggage

As much as production would have liked, there obviously wasn't any time left to ship the crane by cargo. Sure enough the very next day we were at Heathrow in full airport struggle mode as we tried to check in a complete camera crane!

It was at that point Simon reminded me that there is as a single case weight limit of 32 kilos. In the overall rush to leave I had completely

Left: The shore party, right: Longyearbyen, below: The Svae Glacier

forgotten this simple fact.

While based in the UK and working out of my VW Transporter, we generally seem to manage to schlep the Jimmy Jib around in a series of flight cases that each weigh more than the earth itself. Why would I need to worry about case weights?

So here we were at the SAS desk having to repack the entire kit. Luckily I had packed a large rucksack, but the wheels had to leave the security and comfort of their case, and, however upset they were, they had to be ticketed separately.

At the same time, somehow, the carnet managed to materialise having been brilliantly organised by Dynamic in less than two hours! I ran out and met the rep outside Terminal Three, leaving Simon still fighting with flight cases and camera tape.

It was a very close thing but we managed to join scheduled flights from London to Oslo, Oslo to Tromso and Tromso to Longyearbyen.

Longyearbyen

Thankfully, the complete Jimmy Jib seemed to have made it. Inside a three room fluorescent-lit terminal building we met with Emma Murphy the production co-ordinator.

Emma showed us to a small van that she had managed to borrow from a painter. There were the keys, simply left in the ignition. It started first time but the engine wasn't that happy with being there. Also, the inside of the windscreen was frozen, and having stuffed it full of flight cases Simon and I had to stick our heads out through the windows in order to follow Emma to our accommodation. Slightly tricky because looking for more than a few seconds was almost causing skin burn in that sub zero temperature. But, it was marginally better than closing the windows and breathing the varnish fumes that drifted up from somewhere on the van floor

We cautiously threaded our way through this Ice Station Zebra settlement, heads bobbing out of the van, to the Polariggen, a long wooden cabin on stilts, which is run as a hostel. Emma suggested that we leave the van loaded, even though the locks were completely frozen and therefore useless! "Because crime in the settlement just simply doesn't happen."

The whole settlement seemed to be in a basin surrounded by brown and black earthy mountains and hemmed in by the freezing sea to the North.

It had a primeval feel to it. It felt elemental, like some distant planetary outpost.

Why had we come here?

Ship shape

We met up with Gina Marsh, the line producer, over some coffee. The story of the film became completely clear, but the story of the making of the film became typically complicated!

The crew had been staying aboard a Russian ice breaking cruise ship for four weeks whilst they filmed on and around various arctic locations.

We were to join the ship when it returned to Longyearbyen on the coming Saturday. The ship would then sail at midnight on the Saturday, taking everybody to the glacier overnight ready for another early morning start!

It was now Thursday. All we could do was sit round and read Norwegian Maxpower magazines or fiddle with the wood burner. We had been strictly told not to walk around the settlement without a rifle just in case a young polar bear smells you!

In fact, the only supermarket in the settlement has an area where you can place your firearms before you get your trolley and start shopping.

Outside, down by the dock, the low bass thump of a massive twin engine helicopter, signalled the arrival of more and more under-slung loads from somewhere across the fjord. "Ah," said Gina. "How many is that now? We should have three today, two generators and a container."

Soon after that Sean Bean appeared. He was on his way back from the cruise ship to London. He looked very tired and I offered him a beer. He refused: "...No I'm alreet mate, thanks anyway."

I felt it was very important to get exercise at this temperature, and practise some ice walking in our crampons, so that we wouldn't inadvertently stab ourselves when we were on the glacier moving the weight of the camera crane. When we returned to the Polariggen we met with Brian Hall and his No 2, Paul Moores, who were heading up the mountain guide and safety team. It was really good to talk with them and let them know about our particular requirements. They were so obviously geared up for film and TV and we felt very comfortable that they were on the team.

The Polaris

On Saturday morning, the ice-breaker, the Polaris, docked at Longyearbyen. The crew piled off and painted the town. It certainly wasn't red, because we had the painter's van.

Except for a few of the Russian crew, who stared at us blankly, the ship was empty. On shore, two very tough looking Norwegian girls were winching Skidoos from the dock onto the ship's bow.

We piled our kit into what had presumably been a comfortable bar

area, now strewn with used gaffer tape, camera report sheets and various props. We found the battery charging area in what was a radio room, and carefully plugged into some spare UK sockets without disturbing any of the monster Panavision batteries.

After supper in town, we saw the Polaris bathed in sodium light from the dock. The falling snow and the plunging temperature made for a memorable scene. This was to be our home until the job was complete.

That night Polaris slipped its moorings and sailed the three hours to Svea Glacier.

We were woken with the ship's PA system set to warble. Then a message from Stalin, or somebody. After a fumble I found my watch and realised that it was the unit call for breakfast – Russian style.

The Recce

We didn't have the chance to locate the toast before the walkie-talkie traffic started and we were encouraged to standby at our muster station! Very robust looking men moved back and forth carrying rope and ice axes. The Russians and the logistics crew had the Zodiacs ready. The first landing party were asked to load and go ashore.

We then met the grip, Rupert Lloyd-Parry, who came across as a thoroughly decent sort of chap who was obviously a charming ex-public school ruffian. "You'll probably not get to the beach until late morning chaps, we don't actually need this Jimmy Jib until tomorrow, so sorry boys, but just hang out 'til then, yeah," he said as if he was in complete and overall charge of the whole operation.

There was a burst of radio traffic from the third AD on the beach to the first AD, who was obviously somewhere ashore with the DoP and the director, back to the unit manager on the hip. The situation quickly changed. Rupert found me again and said: "Uh, get dressed as quickly as you can old boy, you and I need to go with the next Zodiac to recce the Hero crevasse".

The glacier

I clipped the final pop stud on the neck of my down jacket and instantly began to steam up. I was now dressed with thermal socks, thick boot socks, B3 boots, two thermal layers, a Mountain Equipment jacket with hood, a day sac and thick ski gloves. I struggled down the icy gangway towards the waiting Zodiac, not wanting to lose my footing amongst all those real men ... and girls!

As the boat left the safety of the mother ship and headed for the beach it was possible for the first time to get a feeling of just how desolate and weird this place was. Lumps of ice bobbed around in the ice-still lake-like sea around us. The wind created by the slipstream from the racing Zodiac instantly cut into my soft exposed face and forced my eyes to shed painful tears. I fumbled in my day sac for my ski-goggles. Back in the limestone warmth of Cotswolds it had seemed mad to pack them. In contrast, the Russian driver simply stared bare faced towards the shore.

A monster amount of equipment and resources were pouring ashore in what seemed at first sight like an unorganised melee. A huge stack of jerry cans was supported at one end by Panaflex cases, while Skidoos angrily roared out up the glacier.

The crevasse

We arrived at base camp and I struggled off the trailer and met the producer, Betrand Faivre. He seemed like a very gentle mannered Frenchman with admirable people skills. He was quite at home in this environment.

It then became obvious that we were very much the advance party. There was hardly anybody up here. The director, the DP and the A camera operator were out on the glacier with Brian Hall, working out which crevasses to use and there were three Norwegian guides who were part of the logistics crew with us at base. Except base hadn't yet been built.

The sun had by now fully risen and was in continuous sunrise mode. Everything was permanently bathed in beautiful orange and rose coloured light. I was trying to remember the Lee filter number!

The glacier spread out around us for a great distance and lay between two high mountain ranges; it was impossible to tell how far the hills were away from us, everything being white.

A layer of snow covered the glacier, simply clearing away the top surface with your boot revealed aquamarine blue ice, which was probably 100 metres deep. This slowly moving glacier was apparently travelling out to sea at about a metre a week. At regular intervals lumps fell off into the sea creating huge tearing sounds with monster bass.

The film equipment continued to pile in, but no sign of the Jib, so there was nothing for it but to lend a hand and get base camp up and running.

I fitted my crampons and, for what seemed like the next three or four hours, I worked alongside a multi national team and helped build military canvas tents, moved a mass of pallets, and set up tables and chairs outside that appeared somewhat surreal.

It was almost impossible to work with gloves on, but also madness to expose your skin to the elements and whilst trying to thread a tent together. I badly split my right thumb on an eyelet because of the cold.

The Jimmy Jib on Svae

The deep red blood jetted out across the harsh white landscape. I grabbed a handful of clean frozen snow with my left hand and wrapped it around the wound to help close it, but as I pressed I noticed that my hands where filthy and the now black infected snow was crushed in amongst the wound. "Great," I thought, "I've got to operate the bloody Jib yet!"

The shot

Eventually Rupert called me over and we clumped off for a recce with the director and the other grown-ups. Guided by climber Paul Moores, we carefully traced our way around

Main picture: At the Hero crevasse, below middle: Pea Pod 500 with Arri 435 and bottom: Simon Edwards waits for the camera

several deep crevasses. Now a good distance from base, we came across a particularly awe-inspiring opening in the glacier. This was to be the Hero crevasse that the soldiers would be suspended in whilst we filmed their agony.

Roman Osin was safety roped and he leaned out over the edge looking for the camera position. He found the spot he liked and then each department agreed it was indeed a good place.

Rupert got on his radio to the ship and asked Chris the rigger to bring over a couple of 'Jonesy' decks and some scaff, and 32 'pigsears', and a whole bunch of other weird stuff, so that we could build right next to the edge of this deep crevasse.

I somehow made it back to the beach just in time to find Simon coming ashore with all our kit. There was a moment's slight panic when, as a result of a glacial calving, a small tsunami raced up the shore nearly destroying our precious equipment.

The sight of my beloved Jimmy Jib heaped up on this frozen shore covered in snow and black sand was fairly scary,

The strong Norwegian women from the Logistics team swept forward, picking up flight cases and strapping them down on their trailers. Feeling completely inadequate I picked up a five kilo weight and carefully placed it in position on a trailer then clumsily climbed on the pillion in an effort to protect my precious and now abused camera crane. "Holding tight," said the girl. "We drive like Hell." And so we did.

Chris Belcourt had finished building his deck and the climb team had ice-screwed a rope safety line parallel to the drop so that we could clip on.

The Jib went up quickly despite the cold, and we were built ahead of the 'ready' time.

Classically the unit didn't get to us by the end of daylight and it was decided to go for the shot first thing in the morning.

We laid more ice-screws and strapped the Jib down for an Arctic night on its own with only the polar bears for company.

Dinner on board the Polaris was taken in a subdued clinking of plates and cutlery. Most people's faces were red with windburn. Everybody was exhausted, mostly by the numbing cold, and there was obvious relief that another day was over. The food and a couple of wine boxes were the big morale boost.

Apparently the catering had started off being very Russian, then a French chef had been flown out to improve the fayre.

We made the long uphill journey to base camp and then carefully walked over to the Jib position where we clipped on and started making our final rigging checks.

It was a total white out around us. Simon and I were all alone at almost 79 degrees north on that part of exposed Svea Glacier, with nothing but the wind and my thought that a bear might suddenly rush from a crater in the snow and we had nothing to defend ourselves with but a Jimmy Jib.

At about 08:30 the B camera joined us, followed by the mass of the main. They produced an Arri 435 with a 400ft mag, a massive anamorphic zoom and, of course, Prestons for all three lens functions.

This technopile of machinery was then rudely bolted onto the Jimmy Jib, which didn't particularly like it. However hard we tried, we couldn't achieve anything like a decent centre of gravity with the camera, and as the time started to drag I made the decision to go without a proper balance. I switched the power on and the gearboxes simply took the load as if it were a young mule!

We steadily loaded the counter balance weight onto the back end until we had lift off. This is the point when everything changes, suddenly everybody takes notice, and so the show begins.

I checked that all the controls functioned and then gently lowered the camera down into the crevasse to line up the shot. The A&C head was amazing, even with all this overbalanced weight I was able to pan with ease, the tilt was noticeably struggling, but I was still in full control.

The actors were dropped in on their safety ropes hidden under their costumes. They couldn't wear crampons and so had no way of being able to kick into the ice face and support themselves; they could only dangle, all of their bodyweight forced into a sit harness.

Understandably, they immediately started to swear and complain. As a rehearsal Arwel Evans, the prop master, started throwing shovels of snow down on them. They swore even more.

Finally as their discomfort became almost intolerable we turned over, the mirror flickered the image on the monitor and I craned up and down these poor soldiers as Arwel threw down snow, and kit bags, and prop rifles that just missed the camera and bashed into the bodies of the screaming actors. It looked brilliant!

Planning meeting

We cut the camera, and the actors were dragged out like dolls by a tug-of-war team. We hoisted the camera up and the gate was checked. It was clean.

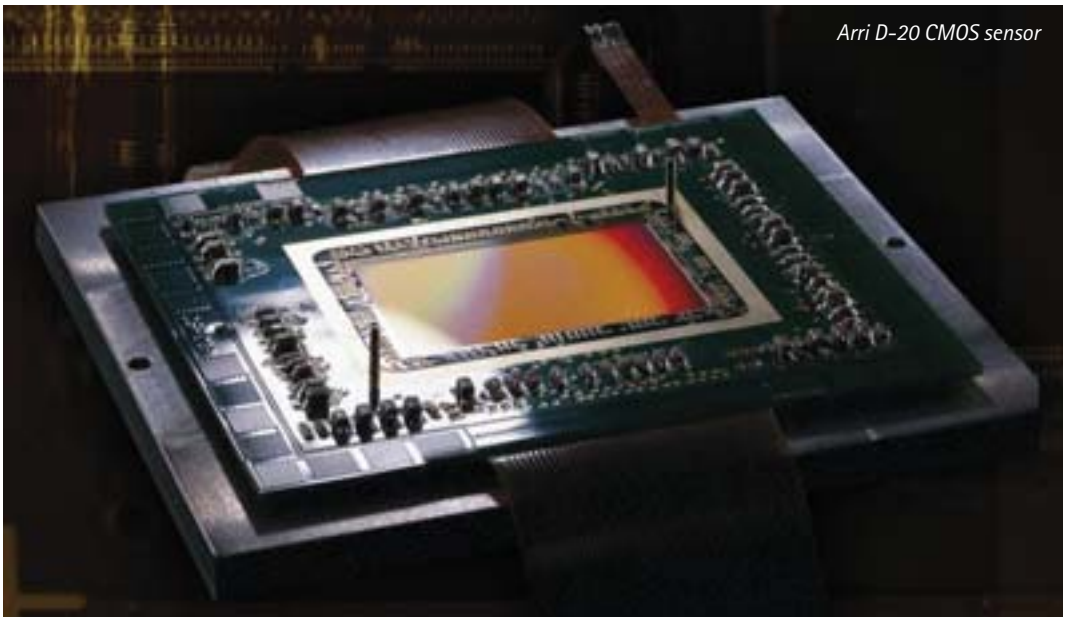
The director smiled broadly, thanked us for our work and said that he was happy and he would like to move on.

Suddenly it was all over. The first AD, Jack Ravenscroft, spoke to the radio mic concealed in his gloved hand: "Thank you everybody, moving on now please, thank you Simon and Simon on the Jimmy Jib well done – by the way, that's a wrap for your good selves.... A camera, I need you ready for scene 327 by the jump location please."

Fact File

Simon Priestman is a freelance lighting cameraman and Jimmy Jib owner/operator. Simon purchased his first Jimmy Jib in 1994 and now supplies camera crane and remote head solutions to the film and TV industry as well as lighting and shooting broadcast features, commercials, and corporates. Web: *www.SimonPriestman.tv* email *simon@-simonpriestman.tv*. Diary: The Digital Garage Co, +44 (0)20 7348 1910.

BEING COMPLIMENTARY ABOUT CMOS



Arri D-20 CMOS sensor

CMOS sensors are finally beginning to make their way into all levels of the broadcast chain, with some manufacturers claiming that they are ideal for multi-format production. David Fox reports.

When camera technology moved to CCDs from tubes, economics were the key driver. CCDs were smaller, cheaper, and a great deal more reliable. At first they may not have offered better quality, but this didn't stop them becoming ubiquitous. In the near future could CCDs themselves go down the tubes, overtaken by CMOS (complementary metal-oxide semiconductor) image sensors? The economic case is not quite as compelling, but CMOS should certainly cut the cost of camera heads, and it can offer higher resolutions in a more flexible way that is better suited to multi-format production.

The cost argument alone is pretty persuasive. CMOS chips can apparently cost 10% (or less) of the price of a CCD sensor. As a CCD head reportedly accounts for about half the cost of a standard definition camera, and possibly even more of an HD camera, there is significant potential for cost reduction.

CMOS sensors use an array of photosensitive diodes, with each pixel containing one diode that converts light into an electrical charge. Unlike CCDs, which output the charge from the pixels serially, as if handing on a line of buckets, CMOS sensors provide a voltage signal at each pixel that is directly proportional to the amount of charge the pixel has collected. Each pixel can be individually addressed to access this information, resulting in greater flexibility in timing or image format. It also means that a manufacturer can use the same camera architecture for SD and HD cameras, as CMOS can output any format, which should also help with costs.

For smaller camera manufacturers without their own CCD production lines, one benefit of CMOS is that it can be produced economically in small quantities, so that a sensor can more easily be built to specific requirements rather than a camera having to be built around the output of a generic CCD. However, even a large CCD manufacturer, such as Sony, sees advantages in moving to CMOS, such as longer battery life.

Of course, CMOS has problems. Its signal-to-noise ratio tends to be higher than CCDs – CCDs are notably better for Pal or NTSC. But, the best CMOS sensors do better (especially the larger chips with bigger pixels), while CCDs perform poorly when used in progressive mode (as interlacing, using line mixing, improves their s/n ratio) and also at higher video rates (there are work arounds, but these increase power consumption, size and cost). The minimum s/n ratio of HDTV should be greater than about 50 – 54dB, so s/n in HD mode should not to be a problem for either CMOS or interlaced CCDs (most of which seem to be in the 54 – 60dB range); but progressive CCDs can be below 50db.

Theoretically, CMOS can handle any format, as it can even read out a single pixel, and can pan and zoom within the signal. It does have a problem with fixed pattern noise. Because it is 'fixed', it might seem simple to remove in the digital signal processor, but it does alter gradually over time as the chip's temperature changes (which CMOS is prone to do – although manufacturers are

Ikegami's new HDK-79EC is multiformat native

addressing this via better temperature regulation), which makes it more difficult, but not impossible, to deal with.

Arri uses special algorithms to get rid of the fixed pattern masking in its CMOS chips. It captures an image of any noise during the dark phase of the shutter and uses that to remove the noise from the subsequent image. However, it requires a lot of digital signal processing in the head.

Ikegami converted

Probably the most significant convert to CMOS recently has been Ikegami, which announced just before Christmas that it is to start replacing its CCDs with CMOS image sensors, with two of its key camera lines switching technology initially.

"CMOS imaging is the future of broadcast," said Naoki Kashimura, Ikegami's general manager for global marketing. "Our collaboration with AltaSens [the American CMOS manufacturer] allows us to be at the forefront of CMOS imaging in the demanding HD broadcast market. We have been developing several end-to-end digital CMOS HDTV camera models using this new sensor technology with its multi-format capability and low power consumption. We look forward to ramping deliveries very soon."

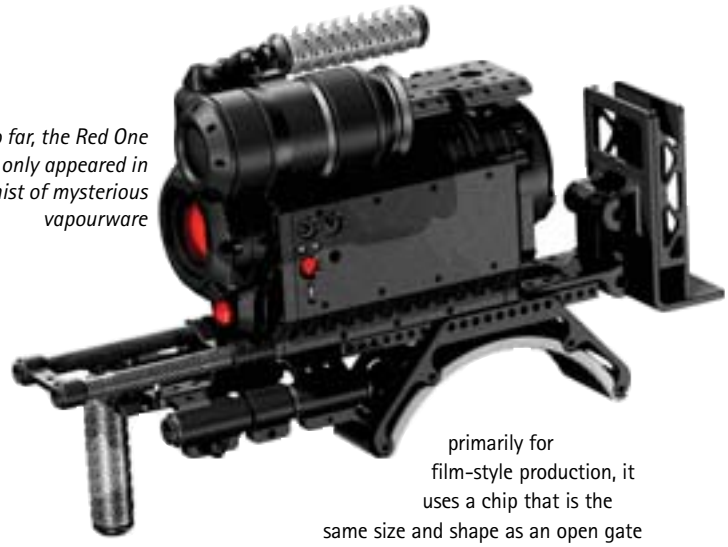
Ikegami has been talking about the move to CMOS for the past few years, but development has taken longer than it hoped.

The three 2.5-megapixel two third-inch ProCamHD 3570 CMOS sensors natively generate 1920x1080 progressive images at up to 72p and 1280x720 images at up to 120p. Its compact design, with built-in 14-bit digital signal processing and noise-reducing tapered reset technology, means that the camera head can be smaller, requires less power and therefore gets less hot.

It uses an imaging sensor-on-a-chip (iSoC) architecture, with an amplifier at each pixel, which means that it only needs external power to produce TV images, as all the processing needed is built in. AltaSens claims that it offers the 'highest video rates, lowest power and lowest random noise currently available.' It uses less than 600mW of power, although other manufacturers have smaller sensors requiring as little as 200mW.

The sensor can read out pixels in any order, so that it is easy to switch between native progressive or interlaced. The output of the sensor is digital, as it incorporates an analogue to digital converter.

Plazamedia's HD1100 'the smallest HD camera in the world'



So far, the Red One has only appeared in a mist of mysterious vapourware

There has been particular interest in the US, where Ikegami already has a lot of orders for the CMOS models.

The changeover will see a new version of its remote box camera, the HDL-40C. There will also be the HDK-79EC, a dockable HD camera that can have either a fibre or triax back. A high-speed version of this will go up, initially, to 1080p 60 or 720p 120. It will use an EVS server and there is a 3x version in development.

There is also a new Editcam HD that uses Avid's DNxHD codec in MXF file format, which will mean that it will only work with Avid editors initially (other formats will be added later). Using its 2.1megapixel CMOS sensors, it will shoot 1080/60i, 1080/50i, 1080/24p, 720/60p or 720/50p as native formats. Disk capacity is 120GB, giving about an hour of recording at 145Mbps.

However, Ikegami has not gone completely CMOS; it has also introduced a tiny new two-CCD camera, the HDL20, for special applications. It uses one CCD for luminance and one for chroma. Both deliver 1000 TV lines.

Digital film sensor

For high-end work, Arri has been the leading camera maker committed to CMOS. Its film-style digital camera, the Arriflex D-20, uses a single chip CMOS sensor. As it is intended primarily for film-style production, it uses a chip that is the same size and shape as an open gate 35mm film frame – 24x18mm. "This allows the use of all opto-mechanical elements as on current film cameras, such as a rotating mirror shutter and, most importantly, the optical viewfinder. Thanks to the same geometry and the physical position of the sensor as with the film camera, D-20 uses all available PL-mount cinema lenses delivering aesthetics similar to that of 35mm film (most importantly, the depth of field)," explains Milan Krsljanin, Arri Media's business development manager.

Another advantage of this approach is the use of a 4x3 sensor, which allows operators to see beyond the frame of capture, as they would with a conventional film camera. "This also allows direct use of existing anamorphic lenses for Cinemascope shooting," without reducing the vertical resolution, he adds. Based on the number of pixels exposed on the sensor, an anamorphic image captured in the D20s new Data Mode contains nearly twice as much information as a 2.35:1 image that has been cropped from a 16:9 capture.

Arri also uses a CMOS sensor in its Arriscan film scanners (having seen what it could do on the camera), and used its knowledge of colour management to ensure that the D-20 should reproduce colours better than traditional video cameras as it boasts a colour-space almost identical to that of 35mm film. "D-20's unique colourimetry, with deeply saturated colours, is what sets this camera apart from anything else currently available on the market," he claims.

"CMOS sensors inherently have superior power efficiency and a natural blooming immunity, plus it is possible to read out any portion of the sensor at any time. This has a wide range of advantages, including the ability to read out high frame rates despite the high pixel count and the ability to run speed ramps. It also

means that the recording format can be freely chosen, so it is possible to trade spatial resolution for frame rate," he explains.

"Because CMOS is essentially a more flexible technology than CCDs, Arri can experiment in the future with new and sophisticated features, like higher frame rates or a double read-out of each frame to further increase dynamic range. Furthermore, thanks to the dual shutter approach (opto-mechanical and electronic), D-20 can produced exceptionally creative motion effects thanks to the fact that the optical shutter can run at one frame rate (as with film) and the electronic at any of the standard frame rates," he says.

CMOS can give improved image quality, because it can be read at any point. So, the camera can read one exposure after 10% of the light has fallen on the chip and another when all the light has, giving a higher contrast ratio. Taking two readings is possible because CMOS is non-destructive and can capture the full dynamic range.

Several UK productions have been shot with D-20 so far, such as the latest series of the BBC's Silent Witness, and production feedback is that "this camera produces outstanding picture quality", which he claims is "largely thanks to the choice of sensor and optical elements around it."

Red dawn

One CMOS camera that has excited a lot of interest is the much-touted Red One modular system, which may one day deliver 1080p/50, 2k, and even 4k for a seemingly bargain $17,500 (possibly even as soon as NAB 2007).

Central to the new system is its aptly named Mysterium sensor. This CMOS chip is super 35mm-sized at 24.4mm wide by 13.7mm high, and the company says it has a signal-to-noise ratio of more than 66dB. It's highly configurable, with acquisition formats from 4520x2540p (what the company calls 4K+, allowing cinematographers to see outside the actual 4K frame), to 4K, 2K, 1080p, 1080i, and 720p, in either 4:4:4 or 4:2:2. It's also capable of variable frame rates. At its higher resolutions, 60 frames per second is the maximum, but with 2K and 720p, 120 fps is possible.

Setting up the D-20 at Arri Media

High-speed HD

Speed is a significant issue in sport, where extreme slo-mo makes it much easier to do analysis. But, most sports don't have a lot of time to wait for downloading high-speed images for playback. This is why the Japanese CMOS-based NAC Hi-Motion camera, which offers full HD at a high frame rate (300fps) and instant playback, has become popular. "People love it. It gives really spectacular slow motion," enthuses Krsljanin (Arri offers it for rental in Europe). "It was heavily used at the World Cup. HBS [Host Broadcasting Services] had one at every match."

Sky and BBC Sport are its biggest users, especially Sky for soccer, rugby, dog and horse racing. It is also being used for effects shots on commercials and TV drama. "We used it for explosion scenes on *Silent Witness*," he adds.

Sky often uses it alongside Arri's other high-speed camera, Tornado, using two Tornados on cricket, running at 1000fps. This is because cricket allows time to download sequences from the Tornado/EQ system; while the speed of the ball is so fast that 300fps is often not enough, whereas with 1000fps you can see every turn of the ball. Hi-Motion offers instant playback, with Tornado being used for analysis. "With cricket, there is a lot of time when nothing is happening," he adds.

Arri is getting more Hi-Motion work than its two units can currently cope with, but it should soon have ten on offer in Europe.

Hi-Motion was originally developed for NHK by NAC Image Technology, with Panasonic developing the CCU and some optics, and Fujinon the prism. It uses 2.2megapixel CMOS sensors and can have up to 24GB of internal RAM (8GB for each colour), which is enough for 11.2 seconds. It will probably be used on this year's Rugby World Cup, although that is still in negotiation. TF1 is the host broadcaster, and all the coverage will be in HD with surround sound.

Small-scale systems

At the other end of the scale, CMOS is also useful for really small cameras, or for low budget HD.

For example, Plazamedia's HD1100 is claimed to be "the smallest true HD remote camera in the world." Jointly developed with TV Skyline for such applications as sitting on the end of a Polecam, the camera head measures just 155x110x40mm and weighs 130g, with a resolution of 1,100 TV lines, progressive scan. The 12-bit HD1100 uses a CMOS sensor, and costs from 18,000 to 24,000 depending on configuration.

Its tiny camera control unit has HD-SDI, SDI and CVBS outputs, and there is a small local control panel with a built-in preview monitor and various camera adjustments. The camera can also be controlled via wireless.

For low budget filmmaking, Sony's new HVR-V1 is priced between its existing A1 and Z1 1080/50i HDV camcorders, but has the added ability to do native 25p (or 24/30p on the US version). The 25p is recorded as interlaced on tape or disk, but should be recoverable in a non-linear editor. It is also the first pro camcorder from Sony to have three CMOS chips.

According to Yuichi Mishima, product branding, Sony Japan, using CMOS offers the advantage of a smearless picture, lower power consumption, and a smaller package than the Z1.

Diamond pattern

The quarter-inch CMOS sensors have 960x1080 pixels, but use a new technology, called ClearVid (from Clear and Vivid), which it claims doubles the effective horizontal resolution to 1920x1080 (using interpolation).

It uses square pixels arranged in a diamond shape (similar to the honeycomb grid used by Fujifilm's Super CCD stills cameras), which allows it to have a smaller pixel pitch (because each row is effectively half the distance across from the one above), and therefore pack more pixels into a smaller chip.

A conventional sensor using a

The V1 uses interpolation to double its horizontal resolution

Sony's Mishima demonstrates the new V1

square grid design captures its highest detail at a 45-degree angle to the grid, so ClearVid takes advantage of this to ensure that its highest detail will be seen in the horizontal and vertical planes (which is where it is most noticeable).

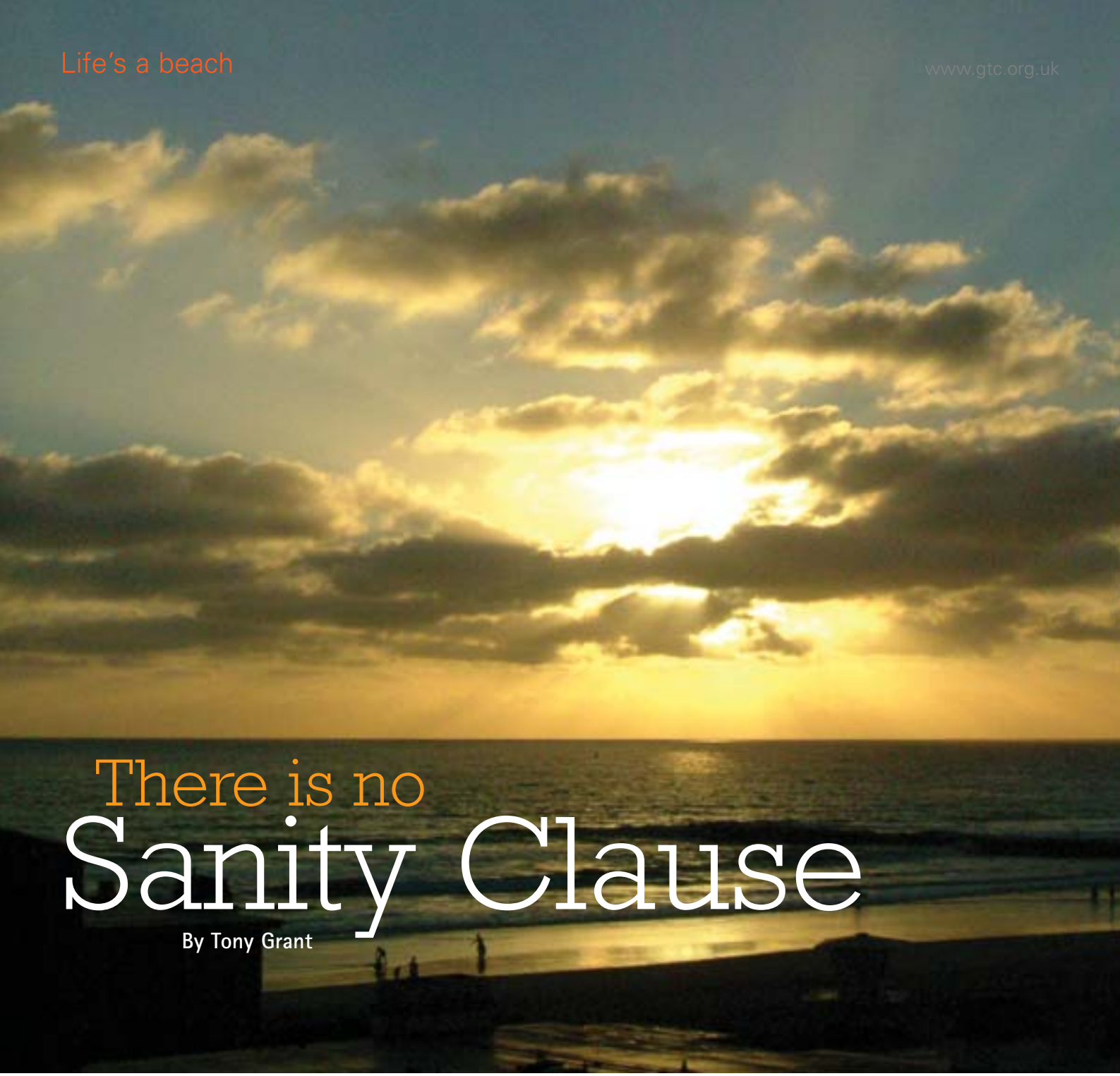
It also boasts reasonable low-light performance for its chip size (4 Lux, thanks to using bigger pixels) and increased dynamic range.

The V1 has an approximate resolution of 800 lines, compared to about 650 lines on the Z1. It also improves on the Z1 in its ability to have peaking and zebra at the same time, and it takes a memory stick, so it can save settings for up to 20 camera profiles. It also has an HDMI output for use with an HD TV.

Other manufacturers also use CMOS sensors, especially for their consumer cameras, but are moving more slowly to CMOS for their broadcast models. However, when Grass Valley launched its new LDK 8000 HD camera at IBC, its president, Marc Valentin, said that: "The LDK 8000 is a rolling programme, delivering an exciting new camera ready for immediate use, and continuing to innovate with advanced signal processing, packet-based fibre optic connectivity and, once they deliver the quality we need, CMOS sensors." Thomson Grass Valley has been talking about the prospects for CMOS for the last few years, so perhaps the next model updates will also see it shifting its pixels away from CCDs.

Fact File

David Fox has worked in TV and radio as a writer, producer and director, and is also associate editor of TVB Europe magazine, and writes for the IBC Daily News and other publications. Contact via: *www.urbanfox.tv*



There is no Sanity Clause

By Tony Grant

You already know how this starts. The phone rings and there's an oily-voiced production manager wondering if I'd be interested in working on an OB featuring bands on a beach. Wheee, right up my street, but I play it down and say: "Well, I might be available", and there follows the usual ritual of dancing around the finer details of when, where, how much, etc.

Of course it's a no-brainer; beautiful summery weather and a week of folk music on a beach at the beautiful seaside resort of Llados on the Llaffan peninsula in North Wales. And I'm being paid (eventually?). Right, you don't want to know the sordid details of further negotiations, suffice to say that I end up looking forward to being cam sup on the six camera OB on the beach. Even better, the events/performances in the competition...

...Ah yes, that came out during negotiations. It's a folk festival with prizes for various categories, culminating in an international award for the best Celtic group, judged by a jury comprising of several esteemed bards. I asked if that was short for baxxards, but this is Wales, remember.

Anyway, back to the plot – the whole shebang takes place during the day, leaving the evening free for performers to lubricate their vocal chords, or whatever parts they feel in need of liquidising. The culmination is to be an award ceremony on the Sunday afternoon, after which we derig and wend our weary ways via whatever hostelry will still tolerate our presence.

So, before the event, I am led to expect that the sum total of my responsibility is to stand behind a camera for the best part of a week (it starts on the Monday) having told the rest of the crew where to go. Everything takes place in the open air, on the beach, during the day. The technical coordinator has sussed the camera positions, and decreed that there is no lighting requirement. Goodness only knows what the sound supervisor plans to do. You are now fully in possession of 'plan A'.

We'll briefly pass over the first few days of the OB, as I'm sure you're not interested in the problem initially faced by production over finding a director. (Apparently some months previously the resident Celtic programme director was summoned to the supremo's office, where he

faced the sixth new incumbent in as many months. He was then told in clipped tones about their new policies for music programming, 'rock on, folk off', and he hasn't been seen since.)

Following a shaky start, we fell on air, although all was forgiven after an impressive opening display led by the massed pipes and drums of the Esso petroleum company.

The sun shone, the bands and groups played their hearts out. It had been decided that a winner would be chosen on Saturday (plan B), and then Sunday afternoon would feature said winner 'in concert'. By Friday, the atmosphere was tense, and on Saturday there were only three groups left in the running. One was Australian, fronted by the legendary Sheila Blige, reputed to do just that long into the night. The other two were Irish, one fronted by Mel O'Dee, totally differing in style to Sheila, and lastly the renowned five-piece Celtic phenomenon Bog Standard. After an emotionally draining but musically rewarding three hours, the winner was announced, and it was, as you may have guessed, none other than Bog Standard.

A light dawns

Now, this is where the story really starts. We've only just settled down to the first round in the Pear Tree, our local pub, when the tech coord comes dashing in and virtually drags me off to the scanner, breathlessly mouthing, 'We've got an exclusive, we've got an exclusive, we've got…….' Having forcibly seated him in his lair, I begin to unravel his ramblings. The lead singer of Bog Standard, one Gerry Attrick, has decided to give us an interview. Apparently, he has never, ever spoken to the media before, and as an internationally famous group, this is unheard of. So, it has been decided to alter the following evening's schedule for a live two-camera interview from the pub (plan C). Oh, and since he (the tech coord) is going to be busy with the rerig and comms, etc., if I didn't have to operate a camera, would I mind lighting it.

"What with?" says I.
"Your lights," says he.
"But I don't have them," says I.

Extremely loud and politically incorrect expletives deleted. Squalid bickering and haggling over tactics, end result:

"OK, get some!" (plan D)
"Where?"
"Your problem."
"Thanks."

No rental company open, and we're almost certainly too far away for them to get to our location in time, even if I could have found one of them on the end of a phone. I have no lighting budget to speak of and only the following morning to arrange things. I morosely wandered over to my car and looked in the back. There were rolls of spun, CTB and ND, plus black wrap, croc clips and a few bits of rope. No lights, no stands, no reflectors, so much for my week of unremitting sunshine.

Wandering back from my car I noticed one of the beach shops still open, and selling, amongst other things, beach mats. What's this? Silver beach mats? £1.95 each? I'll take two. Where's the nearest DIY superstore? A short drive to Plan E&Q is scheduled.

Now my 'rule' of lighting is this, if you've got too much light, you can get rid of it, but if you haven't got enough…….yes, folk off. Moreover, in a pub setting, it's unlikely that you'll find any of the 'pracs' in a useful position.

So, I'll have to work with whatever domestic lights I can find in a superstore, the bigger or should I say Wattier, (if John will forgive me) the better. I was still thinking in terms of desk lights and anglepoises, that sort of thing. Oo-er missus, have you been in a lighting showroom recently? Having located the lighting department, I found myself

I'm gonna need a trolley.

Super Trooper lights are gonna find me

confronted by a bewildering array of tiny halogen spots, in outrageous stainless-steel 'designer' fittings, at absurd expense, and precious little else.

I moved on, and began to explore the gloomier recesses of the shelves (all the unloved items congregate at the back of the bottom shelves in those long narrow aisles). I eventually found some old desk lamps, max 40W for £4.99 apiece, and more modern halogen desk lamps, 50W, about £7-£8 each.

Fortunately, to reinforce my 'rule' of lighting, there was a section for 'working lights' ('who on earth wants to buy ones which don't work?', I would have asked, had there been an assistant within half a mile) which had the 500W floods used for exterior lighting (often with PIR attached to illuminate the passing neighbourhood cats and dogs). Excellent, although I was unsure how I would be able to position them on the location due to the wall bracket mounting they had as standard. But they were only £4.99 each, although they needed mains cable and plugs to reach a socket.

Further along, these same lights were available on stands, instead of the wall bracket, and intended for decorating, or other heavy-duty internal DIY-ing. I was very tempted by these, as you could buy a single one for £24.99 and double head one on a single stand for £29.99, and they had a length of cable and a plug. I would say that these would be ideal for use on a controlled location where there were no members of the public wandering about, who were likely to trip over cables, or crash into the stands. The fact that they had a choice of bubbles (150, 250 and 500W) was also tempting, but I knew I had plenty of spun and ND to help control the light levels.

In the end, I decided I'd take four 500W floodlights (I didn't think I'd want all of them, but if one bubble goes, then it's quicker and easier to remount a complete unit, than try and take it to pieces in order to change the bubble). Since I was running off what was essentially a domestic supply, using them all at once would bring the power consumption up to 2,000W, and that could be pushing things a bit too far should anything else 'beefy' run off the circuit.

Circuit breaker

As in all good stories, and to keep up the tension, I will now digress. This is a true story of one of our OBs (New Leaf, to the uninitiated) from about four or five years ago. We were working for a large car manufacturer, and had to record a round table meeting, which we had set up in their main showroom. We had previously checked the circuit we were using for the truck and the lights with the on-site sparks, and he deemed our loading to be within spec. However, approximately an hour into the recording, everything died.

The sparks was summoned from his local lair, and checked all our equipment once more, and reluctantly agreed that if our claims of the truck's requirements were correct then we were within spec. So off he went and reset the breaker. Ten minutes into recording the power failed again. Local, irate sparks came storming back, and was prepared to take everything to pieces or order us off-site when there was a wail from the nearby reception desk. 'Our kettle's faulty, it won't boil and we haven't had a cuppa all morning.' Yes, unbeknownst to us and the sparks, reception had a kettle underneath the desktop, which was used for the mid morning brew. Moral: when planning an OB, always allow for a kettle (and you can guess who got it in the neck for our troubles, and I didn't even get a cuppa!).

Talking of cuppas, and back to today's plot, whilst I was pondering my purchases, one of the crew had nipped next door to Lidl for some 'provisions'. Before I had made up my mind on what bits to add to the floods, he insisted I had a look next door before committing myself. Surprise, surprise, they also had two 500W halogen floods on a bright yellow stand for £14.99, but the stand's max height was 75cm, and its base was small. Tempting price, but I wouldn't dare rig this in any type of working environment. However, what did gladden the heart, a designer (it must be, it says so on the box) spotlight for £5.99, with a dimmer, that you plug straight into a 13A socket.

This may look like a DIY store... I couldn't possibly comment

Time was now pressing, so it was back to 'E&Q' where I bought the four floodlights at £4.99 each, some sash cord (£2.99), two thin plastic coated wire clothes lines (£1 each) and four mains 4-ways, four mains plugs plus a drum of mains cable (it's cheaper to buy the multi-pack 4-ways, two for £2.99, cut the ends off and rewire them with longer cable than buy ones with long leads). Were I using these floodlights for other purposes on location, I would have had to have used Ceeform plugs and sockets (usually available alongside the 'working lights' in big DIY stores).

Who on earth wants to buy ones that don't work?

But as we were indoors, and running off mains, I felt the ordinary three-pin plug would suffice. Don't do this yourself for an exterior location!

F plan diet

By this point I think we must have reached plan F, er, what's that you

The scene of the crime

say? Ah you're right, this is live telly, and there is no 'f' in plan.

"Where are we going to do this interview?"
"Er."
"What time is transmission?"
"Ummm….."

"What do you mean, WHY DO I WANT TO KNOW? – NO, I'M NOT SHOUTING."

Deep breaths.

"I need to know where to put the f in lights, so's racks can set the f in stop, and whether it's likely to be dark f out the window."
"F out the window?"
"Oh thanks, just make sure the shots are f out any windows in them."

One idea was to do the interview at the bar, but that was (fortunately) overruled by sound, since the noise of the bar area was judged to be too loud and obtrusive. Instead we rigged in a fairly large alcove (my choice all along) with a view of the bar and lounge behind. Working from back to front, I positioned one 500W flood, well out of shot, firmly tied with sash cord to the top of a pillar (thank goodness for pillars in pubs). I gaffered a large piece of spun to a beam about four or five feet in front of it, so most of the light hit the spun, in order that the light in the area where the public are moving around was diffused. But, I let some 'raw' light spill down the rear wall of the lounge to help with the depth of the shot to the rear of the interviewee. A second flood, again tied to a pillar, bounced off the ceiling (just out of shot) to illuminate the middle ground behind the presenter's shot.

The other two floods were tied one either side of a pillar, angled to bounce off a beach mat. I used my trusty Leatherman to make holes at the edges of the mat, through which I threaded the clothesline and secured it above and to one side of the interview position to provide an overall soft illumination for the foreground. I only intended to use one of the floods; the other was a spare, in case the first failed (I've done too much live telly to live dangerously now).

I positioned one spotlight each side of the seats just above head level to provide a 'kicker' for the nearest person, and a catchlight in the eyes of the person facing. I had to remake two of the 4-ways to extend into a suitable position to plug them in and each was fully faded up. They were gaffered in position to the back of stools placed on flight cases, and out of shot. The second beach mat was gaffered to the wall behind and between the cameras to reflect back any light, in case I felt the need of extra fill. My thinking was: if the worst came to the worst, I could always swing a flood round to bounce some more off it.

The other two spots were positioned at tables in the background to add to the ambience, and controlled via their dimmers. I set them on about half power, each plugged into one of the remaining 4-ways (luckily there were sockets within reach, so I didn't have to remake either of these). Should one of the foreground spots fail, the plan was to grab one from the background (but I carefully didn't go into the choreography of its manoeuvre from back to front, although I suspect I'd have been the one to crawl round the lounge to retrieve it).

Award winning

Our live interview with Gerry was an outstanding success, but how did we manage that exclusive, I hear you ask. Coincidentally, we found out prior to transmission that the reason he'd agreed, nay leapt at the chance was because a few months previously he'd learnt of the departure of a certain TV director from the company. Apparently said director had caused him a lot of grief in the past with botched recordings, leading to poor reviews, so he was overjoyed at his dismissal and the interview was his present to us. To celebrate, he told us that he now took pleasure in playing all requests from the audience in the key of F off.

The rest of the interview covered his career almost in its entirety, from riveting revelations regarding how he started with Scuffle, then on to Piffle, after which he eventually formed his first group, Fred Moo & the Udder Fellows. From there, he branched into folk music, and began his long-time association with his renowned cohorts, musicians and friends, Arthur Ittic and Hugh Jarss. Definitely a world exclusive, and a thoroughly mesmerising interview. What did I think? Well, it worked. It looked exceptionally good (that's me being modest, of course it was stunning, where's my award?) and no one in production mentioned the lighting (so it must have been good).

But what if things had been different? Well, that was my original thinking when I bought the clothesline. Since I couldn't be 100% sure where the interview was going to be when I was out shopping, I was prepared to tie clothes line from pillar to pillar to create an overhead rig. Admittedly, securing the floods in position may have required a great deal more sash and/or clothesline to steady them via one or more adjacent pillars, but at least it left my options open. (Old hands will recall that that's how lamps used to be positioned in studios, many years ago.)

In conclusion, as a tribute to a truly marvellous visual spectacle and a wonderful musical occasion, I would like you all to join with me in singing as loudly as possible (never mind the neighbours): 'Four exterior floodlights, three designer spotlights, two silver beach mats, and an OB in the Pear Tree.'

Ay thank you.

Fact File

Tony Grant has gone to get himself a well-earned cup of tea.
All names have been changed to protect the innocent (and reduce the possibility of legal action – *Ed*).

Hogfather

(From left to right) 1st AC Iain Struthers, 1st AD Peter Freeman, key grip Pat Garret, grip trainee Emmett Cahill, camera operator Vince McGahon and lead actress Michelle Dockery.
Picture courtesy of Iain Struthers

Going the WHOLE HOG

By Mark Hope-Jones

Hogfather is the first ever live-action adaptation of a novel from Terry Pratchett's hugely successful Discworld series, the 35 volumes of which have together sold tens of millions of copies worldwide.

Produced by The Mob Film Co for Sky TV, it was broadcast in the UK over Christmas 2006 in two feature length parts and attracted the largest audience ever to watch a UK show on Sky One. The project is being distributed internationally by US mini series giant RHI Entertainment, who put up some of the finance. It has been a bold undertaking for Sky, a company that tends to focus on the acquisition of successful US television programmes. Indeed, its multi-million pound budget represents Sky's biggest ever drama commission.

Gavin Finney BSC was brought on board as DoP early in development, working with the director, Vadim Jean, and producers Ian Sharples and Rod Brown. The planning stage was a long one, during which the intended shooting location shifted from Romania to London and the choice of format was also amended, from film to Arri's D-20 digital camera. "The point at which we were first discussing budgets and formats with Sky was a long time before the D-20 was available," recalls Sharples. "So, we used 35mm as a bench mark and said to Sky that we'd budget for and anticipate shooting on 35mm because of the amount of CG involved, but should the technology

DoP Gavin Finney BSC.
Picture courtesy of Iain Struthers

catch up with us by the time we were ready to shoot then we'd consider moving to HD."

Finney was instrumental in the decision to shoot on the Arriflex D-20: "I came in when it was still a 35mm film shoot and I think it was me who suggested the D-20. Although I believe Hogfather will go to print, it was primarily commissioned as an HD television broadcast for Sky. I was very interested in the new high-end HD cameras coming out, especially the single chip cameras that could use 35mm lenses, retaining the same focal length and shallow depth of field of the film format. The D-20 had this, as well as a film-style optical look-through. It started to look like an interesting alternative."

By the time *Hogfather* was ramping up to prep, the D-20 was becoming available and tests were undertaken at Arri Media in Uxbridge to evaluate the workflow, right through to grading on a Quantel iQ. Finney was impressed with the results: "The main thing was the blue and greenscreen tests we did, when we decided on our settings – recording on HDCAM SR in standard quality using 4:4:4 colour space – and the VFX people at MPC said the keys came off perfectly, without any problem. If they had said it's not good enough, we would have been back on film." The digital intermediate grade would be carried out at One Post and Soho Images, with a clear route through post production established well before the shoot.

Sensor reality

The tests also allayed fears often associated with using HD cameras on a costume and make-up heavy production. "I think the D-20 is definitely more forgiving in terms of make-up, hair and costume than three-chip cameras, and that's not to say it's not as sharp or has less resolution, but I think the combination of using 35mm lenses, shallow depth of field and also just the look of that sensor is less enhanced than some of the other cameras. We made sure that the make-up and costume people looked at the big monitor on set so they could see how their work was photographing. There's a variety of make-up and prosthetics and wigs, especially on the principal characters, and it was absolutely fine; they didn't have to change their techniques at all," reflects Finney.

"We found that the sensor did have a certain quality to it, a bit like how Kodak and Fuji have different qualities, and the D-20 has a sort of filmic quality to it, with beautiful reds, which are traditionally always a problem on tape. That's the point with all of these cameras – it's not about putting them side by side and saying which one is better, because you could never answer that question, it's about which is the best one for the job you're doing."

As successful as the tests had been, Hogfather would be the first major outing for the D-20, a fact that Finney admits would have concerned him had he not such established faith in Arri. "That said, it was always done on the understanding that it was, not so much a work in progress, but that there might be things that change and get better. And the only way of finding that out is shooting for nine

Actor Mark Warren as TeaTime.
Picture courtesy of Iain Struthers

Picture courtesy of Iain Struthers

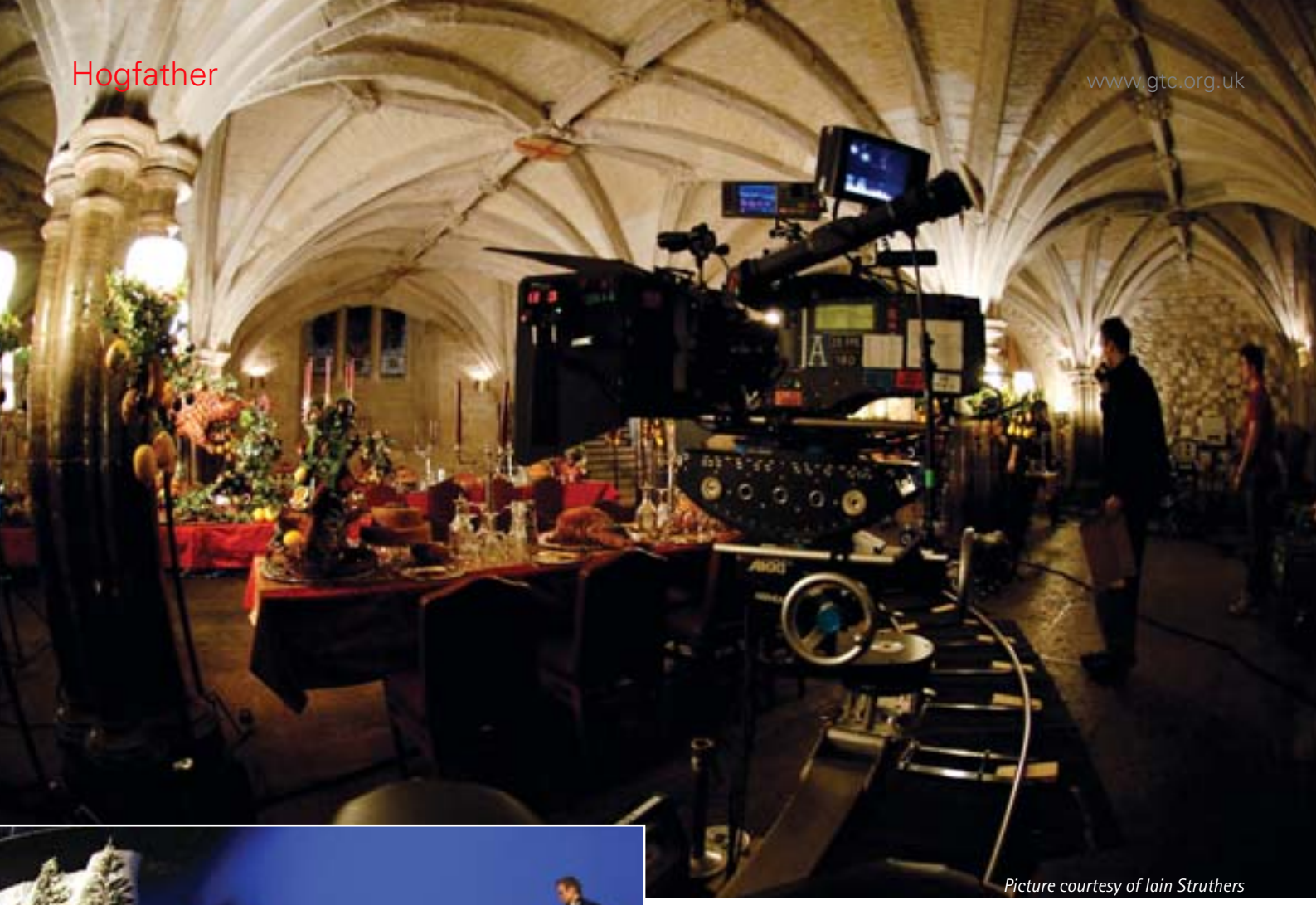
weeks, six days a week, two or three camera units, twelve hours a day. Once we made the decision to shoot in London, knowing that Arri Media was only a phone call away, I was less concerned." The director was entirely behind the decision, as was Sharples: "We understood that we were the first production to use the D-20 in anger and I think we had the right approach, because everyone had been involved in that decision from the start."

Finney was keen not to punctuate his normal on-set functions with long periods standing behind an HD monitor. "This idea of having 24-inch monitors in tents, with the DoP running back and forth between the monitor in the tent and looking at waveforms, I think that's redundant now, certainly with the D-20 – it's simply not necessary. I tend to light from behind the camera, so I used the Astro monitor on the D-20 as my primary light meter, with its waveform display, and that told me exactly what was going down on tape – what was clipping and where I was losing shadow detail. And with three colours on the waveform I could look at a bluescreen and very easily see how evenly lit it was."

In general, the camera was treated on set very much as a 35mm camera. Finney utilised the Cooke S4 lenses he had selected for the shoot in precisely the same way as he would on a film camera. "Another advantage of the D-20 is that the operator is looking through the lens and can check sharps. He can see if the image is sharp in exactly the same way as an operator would on film, so you're not relying on someone spotting it on a monitor. Plus, you have no back-focus problems, which is an enormous asset. Three-chip cameras go out of collimation and there's no warning light; someone has to spot, on the big monitor, that it has floated out of focus. And then you have to go for another take, having recollimated it, which is an absolute pain and a real timewaster."

When the production started, the camera had three ASA rating options, 50, 100 and 200. During the course of the shoot a faster rating of 320ASA was added, which Finney duly took advantage of: "A nice trait of the camera is how the noise that comes in at higher ASAs has quite an attractive structure to it because it's granular and the movement is nicely filmic, so selecting a higher ASA rating wasn't really a problem aesthetically."

The DoP was also pleased with the dynamic range of the camera. "The D-20 definitely has more highlight retrieval than most video cameras. I was easily able to go four-and-a-half stops over-exposed on, for instance, in-shot lanterns, without any



Picture courtesy of Iain Struthers

DoP Gavin Finney BSC.
Picture courtesy of Iain Struthers

clipping." In addition, while grading certain shots at the post house, he found there to be more detail in the shadows than he had realised was being captured at the time.

On set he appreciated the simplicity of the menus on the camera and aside from some colour temperature tweaks and occasional use of the 75% saturation setting, focused his energies on capturing as much data as possible: "When you're going to grade on a system such as the Quantel iQ, where you have a full range of colour correction, there's no reason to do it in camera. You treat it like film; you treat it as a capture medium."

Challenging lighting

The action of the story takes place over the course of a single night, Hogswatchnight, which in Discworld is the equivalent of Christmas Eve. Not only that, but in Discworld there is no electricity, so practically the entire production was a night time piece lit with candles, oil lamps and moonlight. "It was always going to be very challenging for Gavin," says Sharples, "and he rose to the challenge. The quality of what he has produced is fantastic and as a production we're very happy with the D-20 giving us a filmic look, because that's what this particular camera delivers."

"We had a very good crew," says Finney. "Our First ACs – Iain Struthers on the first unit and Mark Barrs on the second unit, learned a lot very quickly and became really good at running and maintaining the new technology. Also Alice Hobden, the Second AC, picked things up quickly and was very fast in setting up and changing cameras over. You need good crew like that." Speed of operation was an absolute necessity as the production had only four and a half weeks to complete each feature length episode, a feat that would never have been achieved without an efficient crew and the director's phenomenally detailed preplanning.

Communication between Finney's crew and Arri Media was of vital importance, especially as the D-20 was a system new to all involved and there were technical challenges to overcome. "The level of support was exemplary," he states. "We gave a lot of feedback in the early days about things we thought could be improved, like how the menu was laid out, and two weeks later the engineers came back and they'd rewritten the menus, from our input. That was very good to see, that our feedback was being taken on board and actually acted upon."

Having secured record breaking viewing figures for its broadcast in the UK shortly before Christmas, *Hogfather* may not be the last Discworld adaptation to be taken on by this production team. Terry Pratchett is famously reticent when it comes to filmed versions of his novels, but he was sufficiently behind this one to take a cameo role himself (as the toy maker) and may well grant his blessing for further adaptations given *Hogfather's* success and its general acceptance by committed Discworld fans. Whether Sky opts to spend money on further high profile inhouse productions or concentrate on the less risky policy of buying in shows from the US remains to be seen.

Fact File

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Wheels & Rotating Menus

Make the World Go Round

Mike Monks shot a DVD in Africa for wheelchair charity, Wheels for the World, using two Sony HDV camcorders. Here's his story.

Imagine a husband pushing his wife down a rutted road in a wheelbarrow or a man who walks on his hands using flip-flops to protect them or a ten year old boy who has never sat or stood unaided, dependent on his parents to carry him everywhere. In Kenya I met Mary aged 21, a young lady who through her inability to walk has spent all of her years confined to a bed in the same room. The loving orphanage in which Mary lives has insufficient funding to provide her with even the most basic wheelchair.

Her inability to travel to school meant that her much needed education had proved impossible and she responded to questions that she clearly understood with grunts and smiles. What these people have in common with millions of others worldwide is their need for a wheelchair and their inability to purchase one.

While in Kenya a charity informed me that five hundred wheelchairs every month are no longer required by the National Health Service in the UK because it is uneconomic to refurbish them. A handful of these chairs are rescued and sent to prison workshops where they are carefully restored by prison inmates working with the charity, The Inside Out Trust.

Prisoners find great satisfaction in this work, which helps restore their self worth and dignity. They recognise that immobile disabled people are, in a sense, prisoners too. One prisoner in Parkhurst Prison said: "It's great

Local workshops with tools and spares are established to maintain the chairs

working on something for people who are worse off than I am. For the first time in seven years I'm starting to feel good about myself."

By inmates giving their time and expertise for only a small financial reward it becomes cost effective to completely strip, clean, paint and rebuild redundant wheelchairs returning them back to as good as new condition. The chairs are also made more reliable for rough terrain by fitting rear puncture free solid tyres and front study solid tyre castors. The Christian Salisbury-based charity, Wheels for the World, collects and stores wheelchairs and mobility aids and ships them out in containers to countries in Africa and eastern Europe to where they are most needed.

In ten years, over five thousand wheelchairs have been reclaimed and put back into everyday use. Volunteer physiotherapists, occupational therapists and mechanics go out on trips spending eight to twelve days on each wheelchair distribution. The mechanics under the direction of the therapists fit all the wheelchairs on a one-to-one basis to ensure safety and comfort. Recipients and family members are instructed in the correct use and maintenance of their wheelchair. They are also offered a Bible in their own language to share the Christian message.

Where practical, local workshops with tools and spares are established to maintain the chairs and provide work for local people. Every distribution is an adventure with challenges, surprises, and occasional disappointments; but, predominantly, each distribution offers hope and encouragement to disabled people.

Hoping for Assign

I went along to film one such wheelchair distribution in the town of Nyeri in Kenya and took my two Sony HVR-A1 HDV camcorders. Nyeri is six thousand feet above sea level, on the equator, and the location of the famous Outspan and Treetops hotels. As we drove from the airport to the location, the presence of potholes in even the best roads became apparent as cars stopped in batches to repair punctures. Paths and tracks off the main road are frequently eroded by heavy rain.

The orphanage in which the bed-bound Mary lives provides homes for 45 children with a care staff of four. Funding is very limited and a wheelchair would be considered an unaffordable luxury, hence Mary remained confined to her bed in the dormitory room, her basic needs met by her fellow orphans and the care staff as best as they are able. When asked what difference a wheelchair would make to Mary, the simple reply was that she "would be able to get outside into the sunshine." Mary received a wheelchair during the distribution and may now enjoy the sunshine and so much more.

Growing bones are in danger of becoming permanently misshapen

Many children leave without a chair, carried away by their mother.

Everyone is assessed to ensure they get the right wheelchair

I've owned the Sony HVR-A1 cameras for over six months and I have enjoyed working with them. Everything falls into place as one feels one's way around the controls. Picked straight from their box they are easy to use and work well. As time goes by, and with practice, the many often subtle features are a joy to discover and utilise.

Accessed via the touch-sensitive screen, I especially like the circular menu that is subdivided into six sections, camera set, memory set, picture application, edit/play, standard set and time/language. These are logically allocated to the three modes of camera tape or camera memory or play/edit. The longest set of memory options takes 13 seconds to cycle through. By repeating the cycle all menu options may be quickly reviewed (or viewed at a slower speed chosen by the user). A selection of favourite menu options can be stored and prioritised in the linear customised personal menu that is reached before the comprehensive rotating menu system. A frequently used menu item such as colour bars may be stored and accessed by a physical push button called Assign.

With both the swing-out screen and viewfinder in use, it is possible to view the menu through the viewfinder while accessing the desired menu options 'by feel' on the swing out touch screen (for example if shooting hand held). Christina Fox, managing editor, *Zerb*, offers camera training courses and passed on two useful features accessed via the touch screen that I'd not discovered. These are spot focus and spot meter (a flexible spot meter). By touching the screen at the point of interest in the scene either focus or exposure is correctly set to that point by the camera. Great stuff!

The ownership of two cameras offers a host of options that I also enjoy using. It is possible to easily dub back up material and to change standards such as from HDV to DV. In Kenya, I had recorded a series of drum sessions, obtaining copyright permission for use in the DVD. I set up early on a cloudy morning to film the sunrise and was enjoying the

What a difference a wheelchair would make to Mary's life

African Tribal Village Elder with Mike Monks

Mike Monks filming in Nanyuki slums (photographer Eileen Sutherland)

African bird song as the sky lightened. But with little chance of seeing the sun, I had the idea to replay the drum session from the second camera via the hotel TV, with the other camera recording the birdsong mixed with the drumming while slowly recording the brightening sky. Although this could have been done post shooting the ability to do this on location was fun and the leader of the distribution was pleased with the result. By time lapse reducing the hour of changing light into a 40 second sequence, the opening title sequence for the DVD was born.

The need for special wheelchairs is highest amongst physically disabled children whose growing bones are in danger of becoming permanently misshapen due to lying in the same position without exercise. The failure of the muscles to develop further compounds the child's disability. The best wheeled sitting chairs are those that may be precisely adjusted over a period of months. This chair then needs to be replaced with a larger chair. The child also requires a second chair for mobility outside the home. All children's chairs are in short supply and in high demand. Sadly, many children leave without a chair, carried away on their mother's back.

One child who crawled to school was only able to attend on dry days, rain kept him at home. It rains often. But, on the first rainy day after he received his wheelchair he was able to attend school powering himself along the muddy path, quite an accomplishment.

Clients of the charity are prepared to wait hours in the distribution reception area for the chance of a wheelchair after years of limited motion. One man had suffered two years of depression after losing the use of his lower body in a road traffic accident. With a wheelchair provided by the charity he has rebuilt his life and renamed his roadside café as The Mobility Inn. He can undertake practical tasks like cooking and is running his business once again casting off the depression while regaining his useful place in society.

Each wheelchair is restored by prison inmates working for the charity

Establishing dialogue

The small Sony cameras performed well in a variety of conditions. I've started to use a PAG top-light to add fill to backlit African faces. The transition of night shot to day light for sunrise and vice versa for sun set works well, remembering to preset the manual white balance.

I've made use of the Sennheiser audio radio link and this works well for short distances. The latest addition to my equipment, supplied by CKE Distribution in Shipley, is a Vinten Vision 3 carbon fibre two-stage tripod with a very smooth fluid head that is handy for long lens shots using the x40 digital zoom facility that allows almost full frame shots of the Sun.

I also use the tripod for locked off shots on one camera while working simultaneously hand held with the other camera. This tripod is well suited to the HVR-A1 and is able to accommodate a heavier camera. I'm still having an occasional problem with tapes sticking in either of my two cameras. This happens with different makes of tape and I've yet to work out why they stick. It is necessary to eject the tape to correct the problem. I plan to visit Sony and/or the tape manufactures to resolve this problem.

I tried to shoot the whole DVD without the need for the addition of post commentary, relying on true fly-on-the-wall technique, using dialogue as recorded while shooting. This proved so successful that the team quickly learnt to ignore me and my cameras while working. The material is being edited as I write and I look forward to seeing the final ten-minute DVD that will be used to help raise funds for the work of the charity. Here's hoping that soon all of those five hundred wheelchairs per month destined to be scrap may soon be rescued and put back into full service somewhere in the world.

If you know of a charity with a limited budget that would benefit from a DVD to be used to help raise income for their work please contact me, my email is: *monksmike@hotmail.com.*

Touch screen scrolling menu

Fact File

Mike Monks is a freelance video journalist who started his professional career as a technical assistant in the Television Recording Department at BBC TVC, London. He worked as an assistant film cameraman based at the BBC Ealing Film Studios and became a freelance cameraman in 1991. He was editor of *Zerb* issue 49. His company, Abbey TV, trades as Mikemonks Ltd, helping to produce DVD's to promote the work of charities. Mike may be contacted via email *monksmike@hotmail.com* or mobile +44 (0) 7736 726 590.

Wheels for the World is financed by donations from churches, clubs and individuals. Please contact them if you wish to help *info@throughtheroof.org.* For more information see *http://tinyurl.com/y6hsez.*

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Sony Business Europe UK Sales	Carl Pring	01932 816368	*www.sonybiz.net/uk*
Tiffen Europe Ltd	Robin Thwaites	01869 343835	*www.tiffen.com*
Vinten Broadcast Ltd	David Monkhouse	01284 752121	*www.vinten.com*

Wouldn't it be great if there was an organisation that...

...was independent and international, and cared about camerawork and the people who make it their craft?
...published regular magazines and newsletters specifically for those operating video cameras professionally?
...ran an internet forum where cameramen from all around the world could exchange ideas, advice, experiences and information?
...provided free workshops and seminars for its members, on subjects as diverse as lighting for night shoots to web design?
...presented a set of awards to cameramen, nominated by their colleagues and celebrating their best work and achievements?

There is!

The Guild of Television Cameramen (GTC) was formed in 1972 and now has well over 1,000 members. Although based in the UK, the GTC membership is truly international, with representation from Singapore to South Africa and New Zealand to the Netherlands. The GTC puts members' subscriptions back into what it does, enabling it to keep the cost of membership low and the quality of services and activities high.
The GTC is a non-profit organisation, run by a council of around 20 volunteers with careers in television, and is sponsored by many major manufacturers and suppliers from the industry. The GTC offers a way for manufacturers, when designing new equipment, to consult with working cameramen to produce outline specifications for equipment such as cameras, lenses and mountings.
The GTC is not a trade union and avoids any political involvements, but it is an authoritive source of advice and information on all matters concerning television cameramen. Its aim is to preserve the professional status of the television cameraman and to establish, uphold and advance the standards of qualification and competence of the television cameraman.

The Benefits

- Two issues of Zerb a year, the journal of the GTC
- Four full-colour In Focus newsletters a year
- A wide range of free workshops on subjects as varied as camera techniques, lenses, lighting, non-linear editing and web design
- Opportunities to be listed online at the GTC website and in a Contact List booklet
- Free accident at work insurance for those under 70 (Details on request, UK Members only)
- Social events, offering the chance to meet with other cameramen from around the world
- Online forum for exchanging news, views and information with cameramen from around the world
- Discounts on products from many rental companies, distributors and manufacturers
- Annual dinner where awards are presented for excellence in camerawork and lifetime achievement and where products are awarded the GTC Seal of Approval

Grades of Membership

Full **£45**	Cameraman with at least three years experience at an established grade in any branch of professional television.
Associate **£25**	Those who love to operate cameras in any branch of professional television, but have less than three years experience.
Affiliate **£45**	Those who are ineligible for any other grade of membership but who would further or promote the aims of the GTC.
Student **£15**	Those attending full or part time courses, recognised by the GTC as being appropriate. Student membership grade to lapse on completion of course.

Payment Methods

UK	Credit Card Continuous Authority Debit Card Standing Order Cheque made out to: *The Guild of Television Cameramen*
OVERSEAS	Credit Card Continuous Authority Debit Card SWIFT (Code: MIDL.GB.22) International money order made out to: *The Guild of Television Cameramen*
OUR BANK DETAILS	**HSBC, Droitwich Spa, UK** Account No: 81207458 Sort Code: 40-19-27

How to Join

Complete the form overleaf and return it to:
GTC Administration, 1 Churchill Road, Whitchurch, Tavistock, Devon PL19 9BU, England

www.gtc.org.uk info@gtc.org.uk 01822 614405

Application Form

Please complete in BLOCK CAPITALS

Surname: _____ First names: _____ Known as: _____

Address: _____

_____ Postcode: _____

Home Tel: _____ Work Tel: _____ Mobile: _____

Fax: _____ E-mail: _____ Web page: _____

Grade/post held: _____ Date of entering professional television: _____
or course (Student) or course end date (Student)

Work address (if different from above): _____
colllege (Student)

_____ Postcode: _____

Please attach a CV, or list your camerawork experience, on a separate sheet of paper

Grade of Membership Required

Tick box as appropriate

☐ Full ☐ Associate ☐ Affiliate ☐ Student

I agree to abide by the Constitution & Rules of the Guild of Television Cameramen.

Signature: _____ Date: _____

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When using credit card continuous authority, after the initial payment, you will be advised of any increases in subscription at the address that the GTC holds on its records and, additionally, you will be advised annually at least one month before the due date, of the amount to be deducted automatically from your account.

We accept the following cards: Mastercard / Visa / Visa Debit / Maestro

Type of Card: _____ Valid From: ☐☐ Expiry Date: ☐☐ Issue No: ☐ if applicable

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Signature: _____ Date: _____

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To: _____ Bank

Signature: _____

Please pay: HSBC, Droitwich Spa; Sort Code: 40-19-27 for the credit of: The Guild of Television Cameramen, account number: 81207458

the sum of: £ .00 **Pounds** (amount in words)

commencing: 1st of and thereafter annually until further notice in writing and debit

my/our account accordingly. Account to be debited: _____ Account No: _____

Signature: _____ Date: _____

Banks may decline to accept instructions to charge Standing Orders to certain types of account.
NOTE: The Bank will not undertake to:
a) make any reference to Value Added Tax or pay a stated sum plus VAT, or other indeterminate element.
b) advise remitter's address to beneficiary.
c) advise beneficiary of inability to pay.
d) request beneficiary's banker to advise beneficiary of receipt.
e) accept instructions to pay as soon after the specified date as there are funds to meet the payment, if funds are not available on the specified date.
Payments may take 3 working days, or more, to reach the beneficiary's account. Your branch can give further details.

BANKS PLEASE QUOTE: Name _____ Number _____ (GTC use only)

Return this form to: **GTC Administration, 1 Churchill Road, Whitchurch, Tavistock, Devon PL19 9BU, England**

Laurie K Gilbert soc, DoP.
www.limage.tv

The Cinematographer's

When asked "what do you do?" the general reply is "I'm a cameraman" and, for most, that's sufficient, conjuring up visions of jetting to wonderful locations, basking on some tropical beach somewhere, chasing exotic animals in a rain forest, etc. But, to reply "I'm a cinematographer" most often gets a blank look. John Rossetti introduces a handy checklist of all the duties of a cinematographer.

All too often the word cinematographer is misunderstood. I therefore make no apologies for reproducing this article that first appeared in the USA and has subsequently been reprinted in the UK by the BSC (British Society of Cinematographers).

It was first compiled by the ASC (American Society of Cinematographers) and then, for the UK version, anglicised for submission to Skillset and publication by the BSC.

It is a fascinating list of duties, bringing home the significant tasks a cinematographer undertakes in the course of a production. My thanks go to Frances Russell of the BSC for arranging permissions, etc.

The cinematographer's responsibilities, as outlined below, is an attempt to describe the duties a cinematographer is likely to encounter during their career. No two jobs are the same and the duties will contract or expand depending on the scale and complexity of the job. As can be seen, there is a vast amount that a cinematographer is required to know and do and this can only be learnt over a number of years of filming.

It has been slightly adapted to reflect British technical terminology.

Picture courtesy of www.polecam.com

Responsibilities

I. Preproduction

A. Conceptual Research and Design

- Discuss all aspects of script and director's approach to picture in preliminary talks with director
- Analyse script as a whole
- Analyse story structure
- Analyse characters
- Research period, events, general subject and appropriate design elements
- Devise style, visualise approach
- Continue talks with director on new ideas
- Come to agreement with director
- Discuss with and come to agreement with production designer
- Discussion and research with technical advisor.

B. Practical Research and Design

- Ascertain or find out budget requirements
- Recce and approve locations
- Plot sun position for locations
- Check local weather
- Check tide tables near ocean
- Review, discuss and approve set plans
- Review and approve props, action vehicles, aeroplanes, boats, horse-drawn vehicles, mock-ups and miniatures.

C. Technical Research and Design

- Visit laboratory to calibrate, customise and evaluate exposure system for any combination of electronic or chemical image capture; and establish developing, printing, set timing and transfer protocols
- Visit rental houses
- Explore new equipment
- Learn how new equipment works
- Invent (or cause to be invented) special equipment or techniques for show
- Standardise and create effects bible for show
- Help create and approve any story boards
- Design (or cause to be designed) and approve any built-in or practical lighting fixture
- Design lighting-plot plan and rigging for stages and locations with gaffer and key grip.

D. Quality Control

- Choose and approve crew, film stock, lab, equipment, second unit and visual effects crews
- Supervise manufacture and testing of new or modified equipment
- Visit sets under construction
- Approve wild walls, ceiling pieces and any moving set pieces
- Check lighting fixture crew
- Walk locations and stages with all departments to discuss requirements
- Approve set colours and textures
- Approve costume colours and textures
- Approve makeup and hair
- Generate (or cause to be generated) and approve equipment lists for camera, electric and grip
- Check rushes screening rooms for correct standards and/or check quality of rushes telecined to tape.

E. Implementation

- Approve stand-ins
- Train crew to use any new equipment
- Walk locations and stages with director and devise shooting plan
- Make list of special equipment for production manager and indicate number of days required
- Work with assistant director on shooting schedule (order of and days required for each scene)
- Estimate and order film stock (type, size and quantity)
- Generate (or cause to be generated) and approve rigging and shooting manpower and man days
- Assist other departments in getting required equipment, manpower and tests
- Maintain regular contact with other department heads.
- Mediate any problems between departments
- Check loading of production trucks or cargo containers for location or international shipping
- Visit cast run-throughs and rehearsals
- Advise and back up director on any problems
- Help producer or studio solve any production problems.

F. Testing

- Shoot tests for style
- Shoot tests for lab
- Shoot tests for lighting of principal actors
- Shoot tests for camera and lenses
- Shoot tests for wardrobe and makeup
- Shoot tests for any special effects processes, unusual rigs, props or methods.

II. Shooting

A. Planning

- Check and approve all call sheets and shooting order of the day's work.

B. Blocking

- Watch rehearsal of scene to be shot
- Devise shot list with director (coverage)
- Choose lens and composition; show to director for approval
- Make sure composition and movement fulfil scene task
- Work out mechanical problems with camera operator, assistant camera, dolly and crane grips
- Set any camera-movement cues
- Place stand-ins and rehearse, fine-tune
- Ensure proper coverage of scene for editor
- Work with assistant director on background action.

C. Lighting

- Design lighting to show

Tom Paterson Steadicam/Lighting Cameraman. www.foragerfilms.toucansurf.com

set/location to best advantage relative to story, style and dramatic content
- Light each actor to reinforce and reveal character
- Make sure mood and tone of light help to tell story
- Design light for minimum reset time between set-ups
- Utilise standby painter for control of highlights, shadows, ageing, dusting-down of sets and props
- Set any lighting cues (dimmers, spot lights, colour changes and any preprogramming).

D. Preparation
- Work out any sound problems
- Work out any problems with other departments
- Check, set and approve all stunts with stunt coordinator
- Set any additional cameras required for stunts
- Double-check safety with all concerned
- Show shot to director to make any final changes
- Get actors in for final mechanical rehearsal; solve any outstanding problems.

E. Photography
- Photograph scene
- Approve or correct take
- Check parameters and reset for next take
- Shoot any plates
- Shoot any video playback material
- Move to next set-up.

F. Administrative
- Define first set-up in morning and after lunch
- Make sure that stills are taken of scene
- See that 'making of' and/or EPK crews get needed footage
- Make sure script supervisor has any special camera or lighting notes
- Check film raw stock inventory
- Try to shoot up short ends
- Check that camera logbook is being kept up to date
- Complete day's work
- Discuss first set-up for the next day
- Ensure that camera, electrical, and grip crews get all copies of equipment rental or purchase invoices and approve before accountants pay

G. vendors
- Take care of any future or ongoing production issues
- Answer any questions about future problems
- Visit production manager and producer at end of day
- Check for return of all unused equipment.

H. Quality Control
- Call in for lab report
- View previous day's work in projected rushes with director, producer, editor and camera crew
- Discuss and approve rushes
- Consult with makeup, wardrobe, production designer and assistant director about rushes
- View, discuss, correct or approve second-unit or effects rushes
- Order reprints if necessary.

I. Training
- Teach beginning actors movie technique (hitting marks, size of frame, lenses, etc.)
- Train camera crew for next job up the ladder.

J. Contingency
- If director is disabled, finish day's shooting for him or her.

III. Post production

A. Additional Photography
- Discuss and be aware of delivery dates for all post production
- Photograph or approve any additional scenes, inserts, special effects or second unit footage.

B. Grading (Colour and Density)
- Grade and approve trailer for theatres and TV
- Approve all optical and digital effects composites
- Grade the picture
- Regrade until correct.

Richard Gammons DoP. www.richardgammons.co.uk

Roberto Schaefer BSC DoP. Picture courtesy of www.gekkotechnology.com

C. Quality Control
- Approve final answer print
- Show to director for OK
- Approve interpositive (IP)
- Approve internegatives (IN)
- Approve release prints
- Approve show prints from original negative
- Approve all blow-ups or reductions

D. Telecine/Colour Correction
- Supervise and approve film or digital original transfer to electronic or film media (Hi-Def, NTSC, PAL, Secam masters, digital intermediates, archival masters, etc)
- Supervise and approve all transfers to and from digital intermediates
- Supervise and approve all letterbox, pan and scan or reformatting of film
- Supervise and approve tape-to-tape colour correction and VMS, DVD, digital projection media, etc.
- Show electronic transfers to director for OK.

E. Publicity
- Do any publicity (newspaper, magazine, Internet, radio, TV, DVD commentary, etc.).

F. Restoration/Archival
- Be available for any future reissue, archival reprint or electronic transfer of film.

Reprinted courtesy of American Cinematographer magazine.
Our thanks to John Hora ASC, who compiled this list and to the American Cinematographer magazine in which it was first published, for kindly allowing us to reproduce it here.

By Alan Bermingham

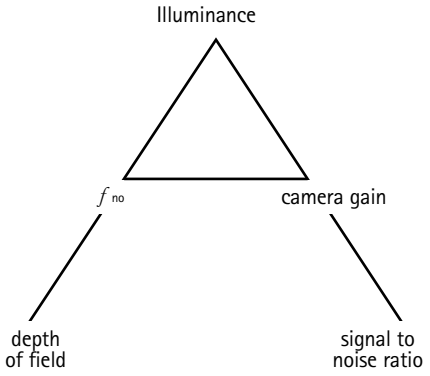
Camera Sensitivity: SD vs HD

What do we need to be aware of?

One of the first questions to answer with any lighting problem is: "How much light do we need?" ie what is the sensitivity of the camera in use?

The usual way to define camera sensitivity is to use the parameter of 'depth of field', ie compare illuminance (or illumination) requirements for similar depths of field for a given shot size and subject to camera distance. This isn't the complete story, however, because three factors are involved in the sensitivity 'equation', namely:

1) Lens aperture – f_{no}
2) Illuminance – incident light (lux)
3) Signal to noise ratio – depends on camera gain needed



These three factors are usually combined in a 'sensitivity' statement by the camera manufacturers eg '*f* 8.0 with 2000 lux, 89.9% reflectance Peak White 61db signal to noise ratio'

This refers to Japanese testing where a test chart has an effective illuminance of 2000 lux as standard and the Peak White 'chip' has a reflectance of 89.9% (all very precise, let us call it 90%)

The 90% reflectance Peak White takes into account the pale skin tones normal to Japan. However, Caucasian flesh tones typically reflect about 30-40% so would look under-exposed if exposed relative to a 90% Peak White. Usually, a 60% reflectance is adopted for Peak White outside Japan. This means that we need more light to correctly expose a 60% reflectance Peak White surface. If 2000 lux is correct for a 90% reflective surface, a 60% reflective surface will only be ⅔rds exposed, ie we need 3000 lux to expose correctly the 60% reflective surface.

Our sensitivity 'equation' becomes:

f 8.0 with 3000 lux & 60% reflectance Peak White, 61db signal to noise ratio.

This is not an instruction on how much light to use, purely a convenient way to express & compare camera sensitivity.

At	*f* 5.6	we need	1500 lux
At	*f* 4.0	we need	750 lux
At	*f* 2.8	we need	375 lux
At	*f* 2.0	we need	187.5 lux

[Note: the illuminance of 2000 lux and the Peak White reflectance of 89.9% are kept as a standard. As cameras have become more sensitive so the f_{no} has increased. Early CCD cameras were *f* 4.5, then Hyper HAD at *f* 5.6 followed by *f* 8.0 and current cameras are as sensitive as *f* 11.0. The signal to noise ratio is about 60 – 62 db for SDTV (Standard Definition TV) cameras].

We now have the camera sensitivity, but what lens aperture should we use? Clearly this will depend on the required depth of field, ie short depth of field – small f_{no}, large depth of field, large f_{no} Custom and practice has resulted in a 'nominal' aperture being quoted which gives an acceptable depth of field and at the same time good 'optical separation' of subject from the background for close-ups.

For SDTV 18mm format CCD cameras the nominal lens aperture is *f* 2.0, this relates to providing the same depth of field as earlier cameras using 25mm & 30mm formats operating at *f* 2.8 and *f* 4.0 respectively.

Of course lens performance may affect your choice of lens aperture if its resolution is inferior at an aperture of *f* 2.0. Often a compromise is chosen, typically *f* 2.4 – *f* 2.8, to reduce the effects of poor resolution of a wide-open lens. Other factors affecting illuminance requirements are:

1) The use of teleprompters, which typically loses half of one *f* stop, ie x0.7; so increase illuminance by

$$\frac{1}{0.7} = \text{x}1.4$$

2) Use of a range extender, an x2 extender increases the f_{no} by a factor of two, ie reduces exposure by a factor of four. So, we need x4 increase in illuminance.

3) Use of a zoom range, which includes zoom ramping. To avoid the effect of ramping use the illuminance value of the largest f_{no}, eg if the zoom ramps from *f* 1.8 to *f* 2.8 then use *f* 2.8.

What about HDTV (High Definition TV)?

Let's look at HDTV cameras operating at 1080 active lines per picture compared with 576 active lines per picture for 625 line SDTV.

The height of one scanned line in 1080 HDTV is approximately half that of SDTV (see later note).

Camera focus becomes more critical with HDTV. The Depth of Field is proportional to the height of a TV line (diameter of the limiting circle of confusion), ie the depth of field at a given lens aperture and shot size is halved compared to SDTV.

How can we restore the depth of field?

Depth of field $\propto$ (Angle of View)^2

or $\frac{1}{(\text{focal length})^2}$

$\propto$ (subject distance)^2

$\propto$ f_{no}

$\propto$ diameter of the limiting circle of confusion – c

For a given shot size and subject distance, the only parameter we can change to restore the depth of field is lens aperture (f_{no}). So, the nominal lens aperture for SDTV using 18mm CCDs needs to *double* to accommodate the needs of HDTV, ie stop down from *f* 2.0 to *f* 4.0.

How much illuminance for HDTV ?

As an example, the sensitivity of the Thomson LDK 6000 MK 2 HDTV camera is quoted as *f* 9.0 with 2000 lux, and a Peak White Reflectance of 89.9% with a signal to noise ratio of 55db.

Again, we need to increase the illuminance requirement to 3000 lux from the generally used 60% Peak White reflectance used outside Japan.

So how much light do we need at *f* 4.0?

The difference between the illuminance at *f* 9.0 and *f* 8.0, say, will be the ratio of the f_{no} squared:

$$\text{Ratio} = \frac{(f\,9.0)^2}{(f\,8.0)^2} = 1.2656$$

So the illuminance required

at *f* 8.0 = $\frac{3000}{1.2656}$ = 2370 lux

or approx 2400 lux

At *f* 5.6 the illuminance needed is 1200 lux
At *f* 4.0 the illuminance needed is 600 lux
At *f* 2.5 the illuminance needed is 300 lux

A teleprompter mirror loses about half of one *f* stop of sensitivity, ie 70% transmission, to restore the exposure at *f* 4.0 we need:

$$\frac{600}{70} \times 100 = 857 \text{ lux}$$

In SDTV the nominal aperture of

f 2.0 (18mm format) gave very little latitude for opening up the lens aperture to reduce the depth of field where the maximum lens aperture was about *f* 1.8.

With HDTV and a nominal aperture of *f* 4.0 there is an opportunity to open up the lens to reduce the depth of field – more optical separation.

Certainly, this is a practice enjoyed at some HDTV studios, ie operating at *f* 2.8 with a teleprompter and about 430 lux of illuminance.

It should be noted that the accurate difference in line height, comparing 625 line SDTV 4:3 and 1080 HDTV 16:9 is an x2.28 factor.

SDTV 6.6mm x 8.8mm sensor

Height of one TV line
= 6.6mm / 576 = 0.0114mm

HDTV 9.4mm x 5.4mm sensor

Height of one TV line
= 5.4mm / 1080 = 0.005mm

Difference in height
= 0.0114 / 0.0050 = 2.28

So strictly speaking we should stop down from *f* 2.0 to 2.28 x *f* 2.0 = *f* 4.56, ie two and one-third stops.

For most practical purposes, however, the approximation of two stops is sufficient.

What about 720 HDTV?

The height of one TV line
= 5.4 / 720 = 0.0075 mm

Difference in line height
= 0.0114 / 0.0075 = 1.52

Therefore, we would need to multiply *f* 2.0 by 1.52 = *f* 3.04

Again, approximating, we can say stop down by one f_{stop}.

In summary – when operating HDTV cameras we need to stop down the lens aperture to obtain a similar depth of field to 4:3 SDTV cameras ie:

18mm format 4:3	625 line	SDTV – nominal lens aperture *f* 2.0
18mm format 16:9	720 line	HDTV – nominal lens aperture *f* 2.8
18mm format 16:9	1080 line	HDTV – nominal lens aperture *f* 4.0

Fractional *f* stops

It is useful to be aware of fractional *f* stops for those occasions when it matters. What is half or one third of an *f* stop?

First we need to look at the typical *f* no series:

f 2.0, *f* 2.8, *f* 4.0, *f* 5.6, *f* 8.0, *f* 11.0 .....

This is a logarithmic series, which is a series of numbers that has a common 'multiplying' factor between the numbers, eg

2 - 4 - 8 - 16 - 32 - 64, where the common multiplier is x2.

A linear series would have a common 'adding' factor eg

2 - 4 - 6 - 8 - 10 - 12 - 14, giving a common factor of +2.

The *f* no series has a common factor of x1.4, and since

$$f\,\text{no} = \frac{\text{focal length of lens}}{\text{diameter of iris}} = \frac{f}{d}$$

only 'd' can change to alter the f_{no}; if it changes by a factor of x1.4 the area of the iris aperture will change by a factor of 1.4^2 = x2.

So we get the familiar halving or doubling of exposure between *f* numbers.

But why should it be logarithmic?

Ideally, the effect of opening or closing the lens aperture should be perceived as a linear change; ie on opening up a lens aperture we should see a steady increase in exposure.

The eye and brain perceive changes in brightness in a logarithmic manner, hence the need for the lens iris to operate in a logarithmic manner if we are to see a linear change.

So what about fractional *f* stops?

Many light meters use ½ f_{stop} or f ⅓ $_{stop}$ values, or ½ EV or ⅓ EV.

Remembering that we need to maintain a logarithmic series, ie a common multiplying factor, we need to double the exposure in two increments, that is by a factor, which, when squared is two, clearly √2 or 1.4.

So, an increase in exposure by half of one f_{stop} requires a x1.4 change in illuminance. A decrease in exposure by a half stop requires a 1/1.4 change = x 0.7

Similarly, to change in one-third f_{stops}, the common multiplying factor must be one, which, when multiplied by itself three times gives two, ie 3√2.

Thus increase by 1/3 stop
= x1.26 increase in exposure

Increase by 2/3 stop
= 1.26 x 1.26 = x1.59

Note: ASA rating in 1/3 stops
= 100 – 125 – 160 – 200

and decrease by 1/3 stop
= 1/1.26 = x 0.8

decrease by 2/3 stop = x 0.63

The above ratios concern the change in illuminance (incident light) or exposure for ½ f_{stops} and ⅓ f_{stops}

What about actual f_{stops}?

$$\text{Exposure} \propto \frac{1}{(f_{no})^2}$$

$$\text{so } f_{no} \propto \frac{1}{\sqrt{(\text{exposure})}}$$

So f_{nos} incrementing in half stops will be changing by a factor of √1.4 = 1.2.

and f_{nos} incrementing in one-third stops will be changing by a factor of √1.26 = 1.1.

This gives us, with a little rounding off:

Half stops (in bold)
f1.0 **1.2** f1.4 **1.7** f2.0 **2.4** f2.8 **3.4** f4.0 **4.8** f5.6 **6.8** f8.0

One-third stops (in bold)
f1.0 **1.1** **1.3** f1.4 **1.6** **1.8** f2.0 **2.2** **2.5** f2.8 **3.2** **3.5** f4.0 **4.5** **5.0** f5.6 **6.3** **7.0** f8.0

In conclusion, we need to say something about ' T ' stops. With the advent of HDTV many video cameramen are using prime lenses, which are engraved in ' T ' stops instead of f_{nos}.

The f_{no} of a lens is purely an indication of lens aperture $\left(\frac{f}{d}\right)$ and as such does relate to the depth of field. It does not give an indication of lens transmission. A ' T ' stop gives a true indication of lens transmission where:

$$\text{T stop} = \frac{f_{no}}{\sqrt{(\text{transmission factor})}}$$

All lenses at the same T stop will give the same exposure. Typically, a zoom lens will have a transmission factor of about 0.8 (80%) and a prime lens 0.85 to 0.9 (85% - 90%).

Fact File

Alan Bermingham has operated in television lighting since 1992 as International Television Training and Consultancy (ITTC), specialising in television lighting.

He has worked as a senior lecturer at the BBC's Engineering training centre at Wood Norton, lighting director at TV-am and head of lighting at Television South West. Alan has run many Location Lighting workshops for the Guild.

Author/co-author of six books, his latest: 'Location Lighting for Television' is available from Focal Press.

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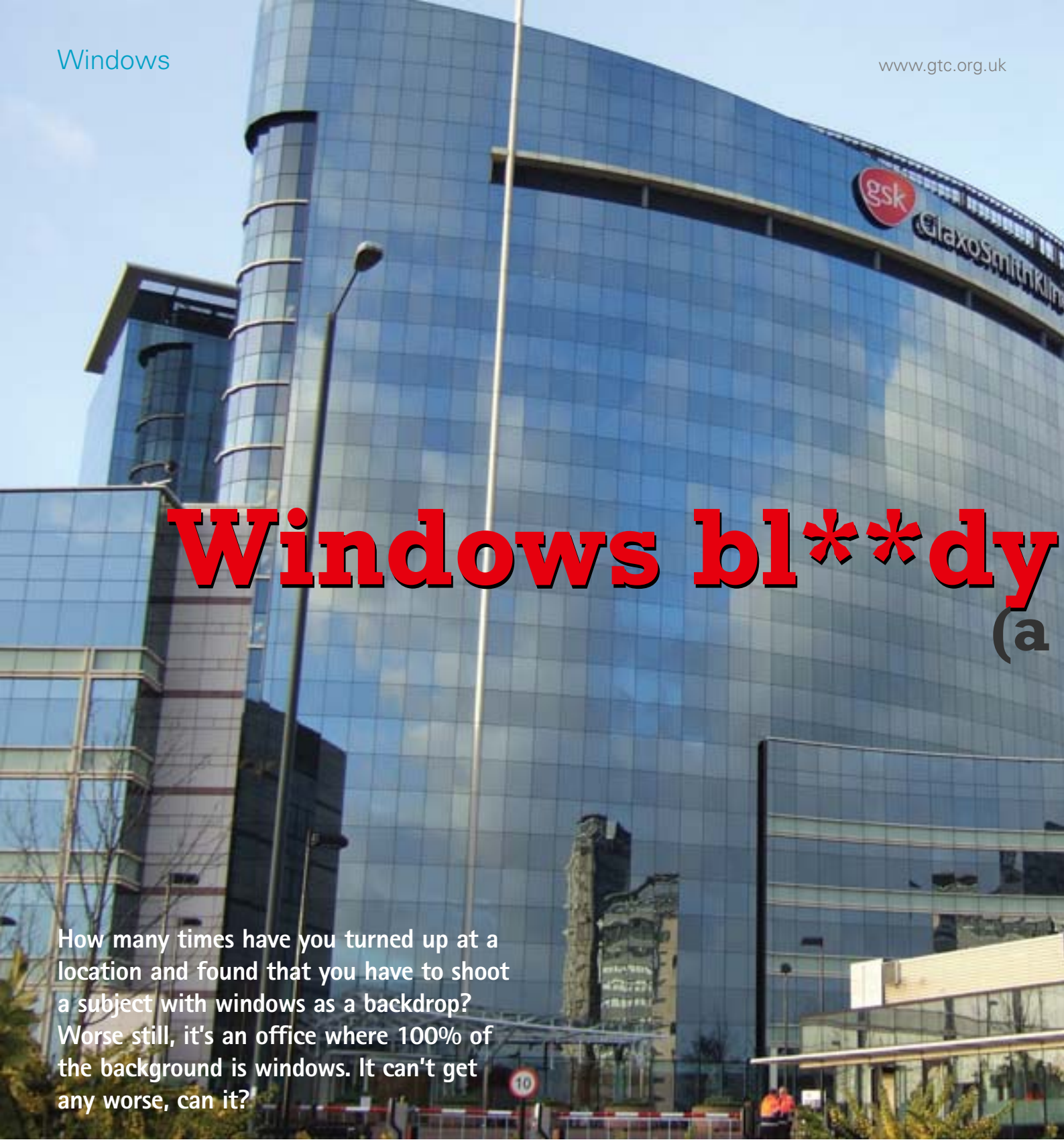


Windows bl**dy (a

How many times have you turned up at a location and found that you have to shoot a subject with windows as a backdrop? Worse still, it's an office where 100% of the background is windows. It can't get any worse, can it?

This kind of situation is likely to arise when the location has not been recced, the event is totally off the cuff or you just had not been warned about the situation. It is for these unplanned situations that I've offered options that might help.

I have assumed that the windows are a critical part of the composition and the obvious option of pointing the camera elsewhere, pulling blinds or curtains, is not an option.

We are therefore usually dealing with two problems: the contrast range between the light available for the inside subject and the amount of light coming in from the outside, and differences in colour temperature between those two light sources.

What to do?

In a nutshell, there are three solutions: One – do nothing! Not so daft if it's very early or late in the day, or that the 'burnt out' look is what the production wanted anyway. Next and most likely, light your way out of trouble or, finally, get out some filters.

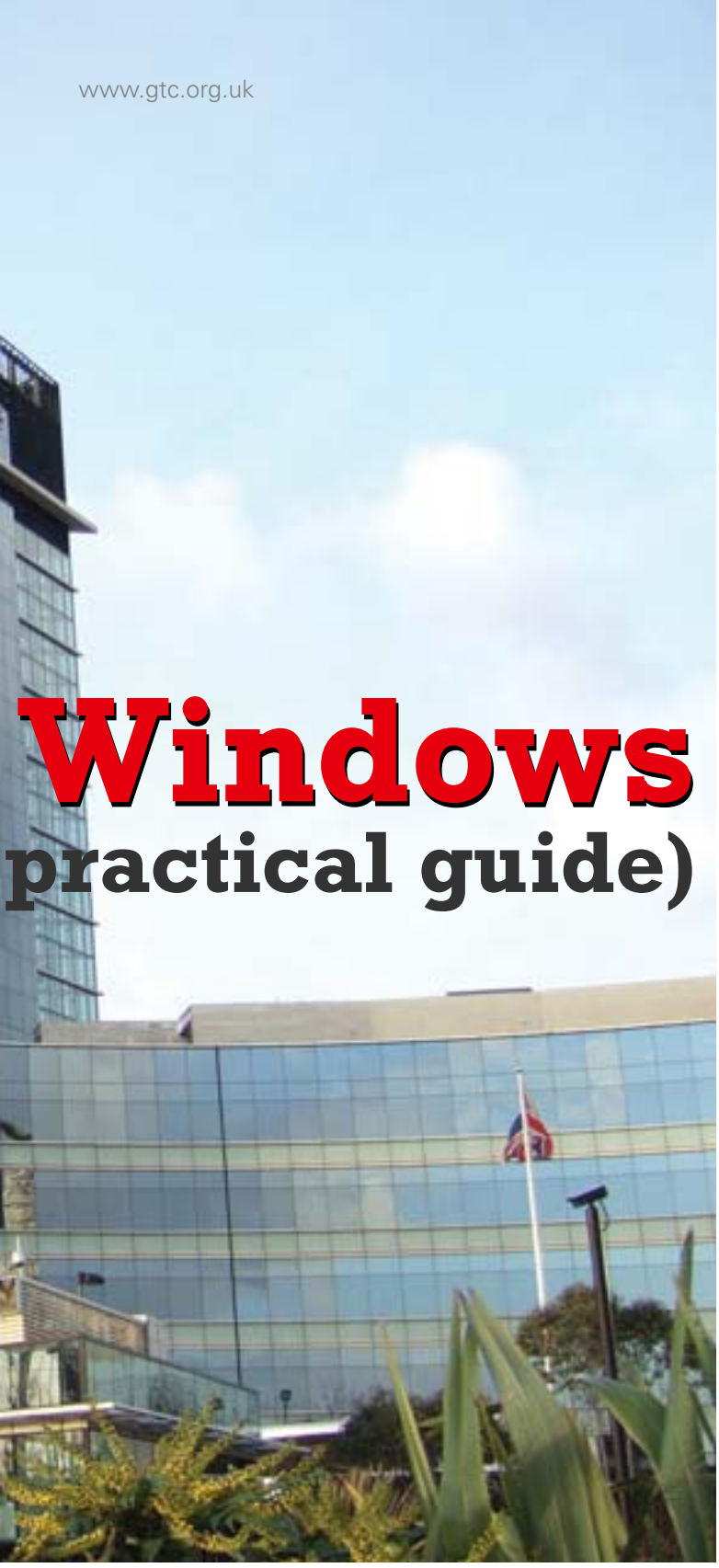
If you have the time and equipment, a fourth solution is to use both lights and filters. A combination of these two will certainly produce the best results.

Lighting the way

If you only have a tungsten lamp you will only be able to alter the contrast difference. However, if you have some CTB filter and a powerful enough light you can balance the differences in colour temperature as well.

In this situation a better solution may be to use a discharge (HMI) lamp. Now you can kill two birds with one stone, ie reduce contrast and match colour temperature. If you're after a perfect colour balance, you may still need to fine tune the lamp with colour correction filters depending on the time of day.

It's worth remembering that if you are lighting to daylight, you will need to change the camera filter wheel to daylight. This has the effect of reducing the exposure coming in from the windows but, likewise, does require you to have an even more powerful light to compensate for the similar loss of



Windows practical guide)

exposure on the subject.

Even lighting the subject up, you may still not have enough light to reduce the contrast difference from the light coming in through the windows, and you may get terrible reflections from the light. This is where filters come in.

Filter tips

The filter option assumes you can get to the windows. If you have safe access you could use ND (neutral density) on the outside or Rosco/Lee scrim on the inside. Remember any filter/scrim on the inside will need to look very neat.

ND or scrim will not affect the colour temperature, and further options to help here would be to use a single filter that combines ND+CTO (colour temperature orange). Bear in mind that nice shiny filters should be used on the outside of windows, well secured and without any wrinkles.

The use of two or more sheets lapped together to achieve the same result as a single sheet of ND+CTO should be avoided to reduce horrible reflections.

You may be lucky enough to have a very good electrician who can very neatly staple the filters to a separate wooden frame on a C stand. I say 'separate' because, as time goes by, you may need to remove or exchange the values of the window filters depending on the ambient conditions outside as the day progresses. If you are trying to achieve a really good balance between inside and outside, you may also need to change the lamp head filters.

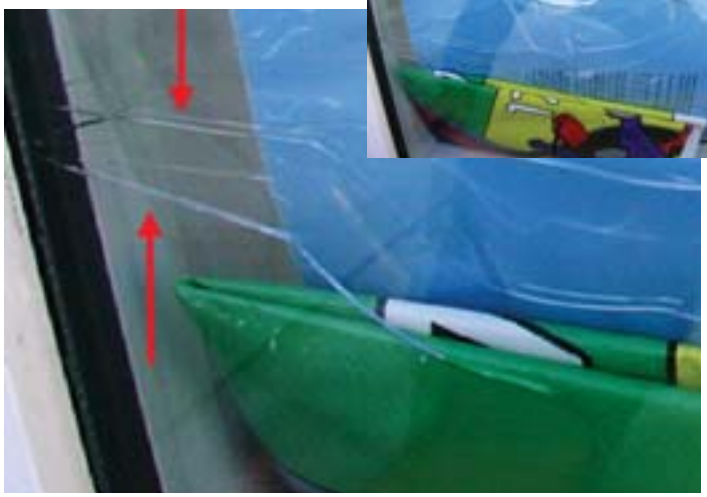
Garry Smith of Pilkington Glass, warns that placing materials over or onto glass can result in cracking especially if it is very sunny. "Like many other materials, when glass gets hot it expands and, providing all the glass is heated at the same rate, it is not a problem. However, if one area is heated more than its adjacent area then stress is induced in the pane. If the stress is high enough it can be released only by the pane cracking."

Smith adds: "Tinted glass in particular gets quite hot. Where solar control films or security film is added to existing glass, the thermal properties are changed, putting the glass at greater risk. In many installations the film is applied to existing glazing and stopped short of the frame gaskets. This can mean that part of the glass is not being heated evenly.

"Adding films [and filters] is one way of increasing the risk. The glass will be hotter if the heat escape is restricted from the inside by adding blinds, curtains or new structures behind the glass. The photo below shows an opaque plastic bag left leaning against the glazing. The heat build up behind the glass in that area has created a large enough temperature differential to cause cracking."

Heat is not a problem with north facing windows, so, if you can try to shoot using windows in that direction. Direct sun will not be a problem either so helping the contrast range issue.

ND (or even a plastic bag) against a window can cause it to crack in the wrong conditions



Camera balanced to Tungsten, no filter on window background colour too blue and burnt out

As first, with 1.2 ND on the window, background still too blue and underexposed by 3 stops

As first, with .15 ND on the window, background still too blue and background still burnt out

Camera balanced to Daylight, no filter on window background colour OK but still overexposed subject now too warm

As first, with .3 ND on the window, background still too blue, but exposure correct

Camera balanced to Tungsten,Orange+.3 ND on window, all OK

As first, with .6ND on the window, background still too blue and underexposed by 1 stop

Camera balanced to Tungsten, Orange+.6ND on window, background now 1 stop under

As first, with .6ND on the window, background still too blue and underexposed by 2 stops

Scrim on window, sits between .3 and .6 ND does not correct colour and may cause moire

How much filter, how much light?

Depending on the weather, the time of day, time of year, position in the country, and direction of shooting, the contrast range could be massive. With many locations it is rare that you will know what to expect until you actually arrive. ND will reduce the light and can be purchased in different densities. Here is a guide to their effectiveness.

- 0.15 ND (298)
  Reduces the light ½ stop
- 0.3 ND (209)
  Reduces the light 1 stop
- 0.6 ND (210)
  Reduces the light 2 stops
- 0.9 ND (211)
  Reduces the light 3 stops
- 1.2 ND (299)
  Reduces the light 4 stops

(International filter reference numbers in brackets)

Black (both sides) scrim (275) reduces light by one-and-a-half stops (you cannot double it up, otherwise you risk moiré patterning in the picture).

There is also a similar double-sided (silver/black) scrim. It's a great 'soft' reflector material, but not really suitable for windows.

ND with colour correction is also available.

Full CTO + .3 ND (207) Converts daylight to tungsten and reduces the light 1 stop.

Full CTO + .6 ND (208) Converts daylight to tungsten and reduces the light 2 stops.

Most of the above filters, except scrim, are also available in large (8ft x 4ft x 4mm thick) panels, great because they don't flex, but not practical if you're on your own. You try cutting one, or getting one in the back of your Ford Fiesta! They fly well in the wind too, but are great on a big shoot with lots of help.

Other problems

Consider an industrial building – a hospital for example. Chances are it will be lit with fluorescents – not those nice Kino types, but horrible green things. So, not only are you contending with the differences in lighting levels, and the daylight/tungsten imbalance we have already touched on, but your interior subject looks green as well.

In this instance I would definitely try to light the subject, or use a

reflector and bounce back some of that daylight coming in. If you are travelling 'light', but not too light, you may choose to carry a minus green roll of filter just for this occasion. It's available in differing amounts of correction:

- ⅛ Minus Green (279) reduces the light by 1/3 stop (slight correction)
- ¼ Minus Green (249) reduces the light by 1/3 stop
- ½ Minus Green (248) reduces the light by 2/3 stop
- Minus Green (247) reduces the light by 2/3 stop (maximum correction)

If you ask your supplier nicely for a cardboard filter box, you can carry six or eight rolls of filter in the back of a car without any fuss, and they will not get too damaged either.

I mentioned the use of colour correction with ND and the use of CTB on the lamps; CTB like CTO is available in different densities, the full CTB is the one that converts 3200 to 5600 (approximately), but it also cuts the light down by 66%.

- (201) Full CTB converts 3200 to 5600 K equivalent to 1 ⅔ stops
- (281) ¾ CTB converts 3200 to 5000 K equivalent to 1 ⅓ stops
- (202) ½ CTB converts 3200 to 4300 K equivalent to 1 stop
- (203) ¼ CTB converts 3200 to 3600 K equivalent to ⅔ stop
- (218) ⅛ CTB converts 3200 to 3400 K equivalent to ⅓ stop

If you are only going to carry one roll, I would recommend the 281.

Putting the theory to the test

OK, you arrive at the location and you're given the problem, what's the quickest way to sort it? I would set up the shot, set the camera to auto and take a reading off the iris and compare that with a similar reading again on auto outside, calculate the difference and use the appropriate density of filter.

Having done the ND part to balance the contrast you only have to worry about the colour temperature differences.

This method is so much quicker than cutting up rolls of filter and holding them up to try. Another tip if you are short of internal light is that fluorescent lights can have tungsten, daylight or a 4100-Kelvin bulb without the need for filtration. The 4100K bulb is particularly useful as it allows you, depending on the time of day, to do an electronic white balance between the interior and exterior without the need for the camera filters; but it will only work in the morning or afternoons.

Clearly, the ultimate solution depends upon outside conditions where colour temperature can vary from 10,000K on a blue sky, through 6500K midday, to 5000K and even 4000K early and late daytime.

There is, of course, one occasion where you actually want this massive contrast range: the good old Silhouette shot.

Finally, the look of the light in this window scenario can be relevant. I'm not too happy with very diffused light coming in through the window and the subject being lit with hard light, so I think that other than getting the contrast and colour right, consideration should be given to the look, and this is where diffusion comes in.

Diffusion confusion

I was going to do a whole article on diffusion, but my editor and I visited the Lee factory in Andover and actually found it's simple really.

When you open any brochure or swatch and search for diffusion material, you will find groups such as 'spun, frost, flexi-frost, grid cloth', and of course plain diffusion, all media that in one way or another affects the look of the light AND the contrast of that source.

Lee Filters have 39 different types of diffusion to choose from, excluding the coloured ones. Plus, there are all the other manufacturers Rosco, Cotech, etc., who also sell diffusion. You could try each of them, but their differences can be very subtle. So, how do you know which one to use?

There are so many in the range, partly because users have always had their favourites and others have evolved with subtle differences, and are kept in the range because existing users don't want to change. Plus, companies don't just manufacture for the UK; preferences around the world differ. Opal is popular in the USA and grid cloth in Spain.

You could start by deciding if you want flame retardant or non flame retardant. Note the word retardant. Nothing is flame proof. Anything will burn if it gets hot enough. You won't find every type of diffusion media in both categories because the process alters some of the diffusion characteristics.

Another reason could be that you want a filter that is pliable and you want to wrap it around things, without it getting damaged. This is why the most popular is spun, or tough spun as it's sometimes called.

Finally, you may not want to put the filter over a light, you may want it over a subject, a car for example, and so diffuse daylight outdoors. In such cases sheets may be sewn together and mounted on large 24' x 24' frames; hence the range of flexi Frosts and grid cloths, that's what they are for, clip them to barn doors and they could melt.

Frost, such as white frost and heavy frost, offers medium to low diffusion to a light beam but does not alter the shape of the centre of the light.

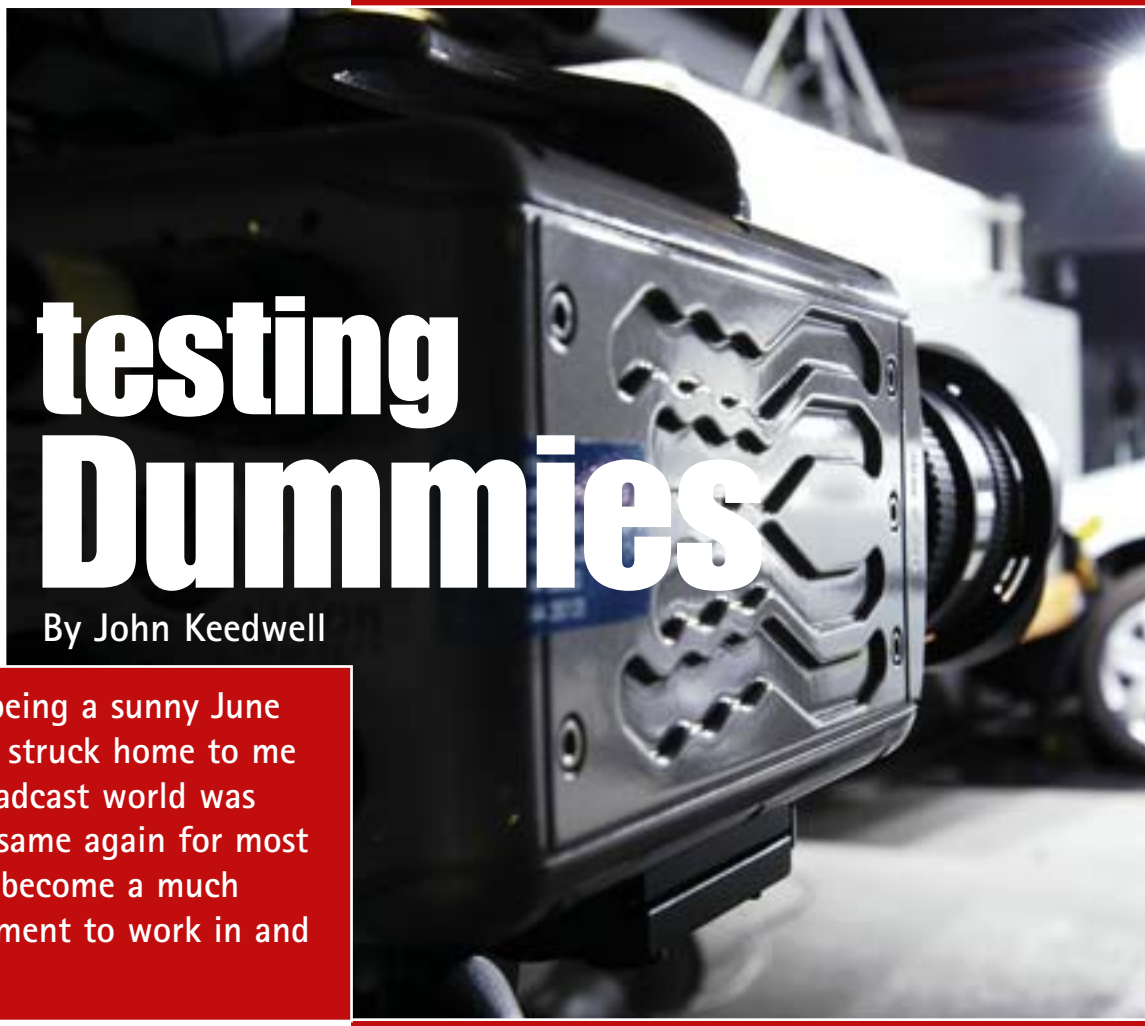
Brushed silk and white diffusion spreads the beam and reduces shadows. Generally, the beam is smoothed and they are ideal for cyclorama lights. Finally, spun, (same as tough spun), softens the light, reduces the intensity and is durable.

Lee has just produced an excellent poster listing all these types of diffusion, together with illustrations of what effect each filter has on the light beam.

Like a lot of things in our industry, there are no hard and fast rules and each scenario will require a different approach, after all that's what makes us what we are and what we do, using our eyes, to get the look.

Crash testing for Dummies

By John Keedwell



I clearly remember it being a sunny June day in 2005. It finally struck home to me that the freelance broadcast world was never likely to be the same again for most camera people. It had become a much more difficult environment to work in and make a decent living.

Broadcasters had introduced some strange new methods of working. Almost overnight they dictated the type of camera used and they had bought many of the new smaller cameras and desktop edit suites, expecting the "younger filmmakers" to embrace their working methods.

To many, this was a huge step backwards in quality of image. We had a great opportunity to stretch the boundaries and make great steps forward in quality with some fantastic new developments in camera technology, yet we were actually going backwards at a great rate of knots.

So, I decided to get a "proper" job, as scary as that sounded to me after 21 years as a freelancer. I'd noticed a vacancy that required a High Speed (HS) camera operator with broadcast camera experience and a stills photographer with knowledge of Photoshop. These vacancies just don't come along that often, so, I applied. I started at Thatcham in early June 2005.

Auto route

The Thatcham Motor Insurance Repair Research Centre (MIRRC) is primarily funded by the insurance industry. They are probably best known in the UK for their work rating security car alarm systems. Thatcham specialists try to overcome the defences, and alarms are rated accordingly for insurance purposes.

But, they also research vehicle design and then advise manufacturers on how to make vehicles easier to manufacture and repair. Another part of this involves filming specific impacts on new pre-production cars, and these are used as part of the Insurance Group Rating for new cars. I had eventually found a place to work that literally saves lives.

Speed camera

My main role is the operation of the HS digital cameras that can capture events at 1,000fps. The cameras are capable of much higher speeds than this (albeit with a trade-off in resolution), but we shoot at an industry standard of 1,000fps at the highest resolution. This means that, when played back, a one-second event would last 40 seconds at the normal playback rate.

The main use of this facility is to capture car to car impacts, car to stationary object impacts (such as a pole, wall or barrier) and also seat testing to minimise whiplash. Most events that the engineers want to witness during the actual tests last much less than a second – in most cases about a third to a quarter of a second. We have to analyse motion in the minutest of detail and that's where I come into the equation.

The resultant videos are analysed with motion tracking software called TEMA (or Track Eye Motion Analysis), and the tracking points on the Anthropomorphic Test Device (the crash test dummy) are tracked automatically. Various data of angles and changes in velocities can then be combined with the internal data from the accelerometers within the dummy to give an overall picture of forces and distances moved, etc.

So, the HS video side of the operation is obviously a vital part of the whole data capture, and gives a visual indication of what happens, which pure data could not achieve. The videos we produce are also used for presentations to the trade all around the world to explain what we are proposing, which also forms a very important part of our work.

To capture motion at such high frame rates requires a great deal of specialist equipment.

Special high frame rate cameras are required, of course, plus flicker free lights (and lots of them!). We need a control system that is able to trigger the cameras, and a camera control computer that is really at the cutting edge to download and manipulate the still pictures back into a moving video.

Road testing

The cameras we had in the crash area when I arrived at Thatcham were Redlake (or Lake Imaging) HG2000's with a sensor resolution of only 512 x 384 pixels. Obviously, this is extremely low resolution compared to a mainstream broadcast camera, and there is certainly more pixel count available on most mobile phones nowadays. They were bought over six years ago. However, technology has since marched very swiftly on.

I started looking at other HS cameras to see what else was available. We looked very closely at Photo-Sonics (now Vision Research),

Inside the crash lab with the new Phantom cameras

HMI Ballast

Connector box

NAC, Weinberger G2, Olympus, Photron, Redlake, and more specialist camera manufacturers. Most of the main contenders were then properly tested in a real situation by actually crashing a car into the crash rig and shooting the resulting mayhem! This was quite fun as well as an extremely useful comparison between the camera systems. It was also useful to see the way the final results could be converted into a useable form to watch as a video sequence, and the user friendliness of the software was crucial to examine as well.

Phantom V9

For scientific purposes the engineers only really want to see exactly what happens in slo-mo detail, and are not really that fussed about colour depth or how pretty the picture looks. For broadcast and commercial use, however, the picture quality is paramount and a higher resolution is required, along with no banding over the picture, and high shutter speeds to freeze each frame to minimise motion blur.

In April 2006, one camera system clearly stood out over the rest, so a decision was made to purchase some cameras from Vision Research. We ultimately decided on the Phantom V9.1, a cutting edge camera that has a CMOS chip with a resolution of 1632x1200 pixels, which exceeds some HD cameras.

It shoots 1,000 pictures per second at that resolution and has an electronic shutter that can capture down to 2µs (2/1,000,000 sec) exposure time. I have even captured a single Phantom V9 colour image from one of the car tests and printed it to A3 size, with no additional Photoshop work done to enhance the image, and it looks stunning.

The speed of download and conversion is also a big consideration. On a recent series of multiple camera tests we had to use some of the older cameras alongside the V9. As an example of the speed of use, I had batch downloaded two of the V9 cameras and had started producing the AVI's whilst the other cameras were still only half-way through downloading the first camera, which had a tiny fraction of the data!

Torque converter

The weak point in this chain are the lenses. We normally use Nikon stills camera lenses, which are not designed for Hi-G use. There are only a few specialist Hi-G rated lenses available – for a price. They tend to be quite wide-angle models such as 10mm or 14mm lens because most tests of this nature are shot in confined positions.

One way to protect the lens is to have a rugged metal cage built around it, and various points are held in suspension around the lens. This doesn't protect the internal elements if it is a normal lens. So a HI-G lens is preferable for on-board use as they are designed to sustain the huge G forces generated by the tests. It means that the internal lens elements to not detach and break inside the lens.

Gear shift

Like many aspects nowadays the cameras are getting smaller, yet are generating much more data - approximately 1.5Gb per camera in under 1 second. This means it is not possible to record onto tape or a hard drive. So, we record onto internal solid flash memory.

The Vision Research V9.1 cameras can potentially accept up to 12.2Gb internal memory, which will record 6,400 images, or up to 6.4 seconds of motion capture at 1,000 fps. This is overkill for most automotive crash use, and 1.5Gb memory is used on each camera, giving just under a second at 1,000fps. Out of these 1,000 high definition images we may end up utilising 250-300 frames to make a final recording.

Pedal to the metal

We cannot rely on human reactions alone to trigger the cameras, as the tolerances to reaction time and the available memory on the camera is so tight. Also T-Zero (the trigger at point of contact or impact point) needs to be precisely measured and everything is calibrated from that point, so an accurate and repeatable method is required.

Triggering the camera is normally done by a vehicle making a physical contact with a special trigger strip, making a simple electrical contact. Other methods such as the vehicle breaking light beams, hand switches, sound operated or other electronic means can sometimes be used, but they are never as simple and effective as physically hitting a trigger strip.

If the recording starts at the point of impact, it is too late. So, when the cameras are primed they are put into continual recording loop and they record continually until a trigger signal is received. It is similar to the retro loop recording found on some high-end broadcast cameras, where the scene is recorded before the record button is depressed. This way the vehicle can be seen (for a fraction of a second in real time) approaching the target, and the point of impact is then recorded.

At the same time as the cameras are triggered, a second trigger strip sets off an electronic flash, which is a burst of light that gives a visual cue to T-Zero. A third trigger strip activates the Digital Acquisition Unit, which takes the digital data from the many accelerometers within the vehicle and the dummy.

Full Beam

Large lighting levels are needed at high camera speeds for the usual reasons regarding basic photographic principles. Additionally, it is critical that the lighting profile is uniform over the entire area of investigation. The lamps also need to be relatively close to the subject; otherwise the

Still images taken from Phantom V9 camera

Phantom V9 Camera with Nikon lens

light levels wouldn't be nearly high enough.

Special high-speed ballasts are required that are flicker free at very high camera speeds, and these are made by Power Gems. In the crash lab we currently use 12 or more 4kW HMI lamps and their ballast enables them to run at 200% for a short time during the impact. They then are left on at their normal level for about 20 minutes or so to run a "cool down" programme within the ballast units. This has to be done otherwise they wouldn't work the next time you used them due to overheating.

We can also use a few spotted up 2.5kW HMI's on floor stands if we need to fill and slightly lift a small area. The main lamps are all concentrated on an area about six metres wide, so it is pretty bright and rather hot at the moment of impact. Even so, the aperture is perhaps f2.8 or f4 at about 250_s (micro seconds) or 1/4000th of a second shutter speed.

Interestingly, Cirro-lite has recently showed a 100kW Long strike lamp that would be a great tool for the high-speed cinematographer. There are also the Dedo cool lights that are specially designed for high-speed table top work. Some manufacturers have also demonstrated some great LED lights that are robust enough for Hi-G onboard work. LED's have many advantages of very high output for low current drain, and no filament or bulb to distort and break.

Cut and shut

Traditional camera sensors and electronics can severely limit how fast they record a series of images. High-speed camera manufacturers have to organise the chip into many separate segments that provide simultaneous streams of data to be recorded. This is the only way to get the data off the CMOS chip fast enough.

Multiple streams of data can be more easily recorded than a single large dump. This potentially makes it a difficult challenge to seamlessly match up the various effective separate sensors to reconstitute the original picture. Some manufacturers do this better than others.

Speed of image production is paramount; we can have high-speed images available for analysis within seconds of the test taking place. Video feedback is available to clients immediately on seeing how the test worked, and can sometimes be used to "fine tune" the performance of a seat or other car component when a client is present. On one instance recently the second test provided much improved results, predominantly due to the analysis of the video and the timing trigger being altered accordingly.

Commercial vehicle

These new breed of cameras are now being used seamlessly with 35mm commercials, natural history programmes, broadcasts, corporate, scientific and other areas. As the results of the shoot are known almost instantly there is often less need to do so many retakes ("just to make sure we got it", or " let's do another one for the insurance company").

At Thatcham I have recently shot a fair amount of high-speed footage with the V9s of such diverse items such as grinding wheels, smashing windows, welding, paint spraying from a paint gun, and other items to be used in the various promotional videos that we also produce. The results are truly beautiful, and for the moment we have to downsize the pictures to fit the SD video we currently have (although we are about to take delivery of Sony 750 HDCAM cameras and also edit machines soon).

It is true to say the technology has advanced to a level that was unthinkable even a few years ago, and the very specialist and technical nature of the business means that skilled specialist camera people will be required. I think I have found a niche area that I am constantly learning, and that makes it very challenging and extremely exciting for me to turn up to work each day.

Fact File

John Keedwell is a GTC and GBCT cameraman who has now been in the film and TV business for more than 23 years. He has travelled to 47 countries on many documentary shoots in many different climates, and has also worked on music documentaries alongside musicians such as Bon Jovi, Pink Floyd, Judas Priest and with George Harrison and others.

John now works with a small team at Thatcham as a high-speed camera specialist, and also produces and shoots HD videos and also stills photography for Thatcham. He also writes articles for various trade magazines.

John can be reached at *zerbhs@echelonfilms.co.uk*

www.thatcham.org
www.pixoft.co.uk/nac.htm
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www.cirrolite.com
www.lightningstrikes.com
www.gekkotechnology.co.uk
www.visionresearch.com

Lucy Woodward holding her portable Akai VT150

Video ARK

Zerb has always been about promoting cameramen, the work we do and the equipment we use.

The vast majority of what we shoot has been recorded onto video tape. So, it seems right to interview someone who has a passion for video tape recorders and has the skill to ensure that what has been recorded does not get lost or become unplayable. Lucy Woodward is the owner of the Video Ark. She confesses that she is nuts about TV history and passionate about restoring archive material faithfully from the tapes she works on. Christina Fox and John Rossetti went to meet her.

Lucy, explain what the Video Ark is?
The Video Ark is a service for anyone who has any kind of archive video or audio material that they want to play back or transfer but cannot because they don't have the machines, or they do have the machine but it is defunct or they don't know how to work it.

How long have you been going?
Since about 1988. I had an interest in magnetic tape recording for as long as I can remember, which I inherited from my grandfather. Having flunked my A level courses at school, and having wanted to be a school teacher, I was stuck for something to do. So, I thought, let me fall back on some hobbies, and I thought of recording and contacted the BBC. I basically said: 'You don't know me, but would you give me a job please...', and they did. They put me in television. This is a very common thing at the BBC. When you write and tell them you are interested in radio they put you in television and vice versa.

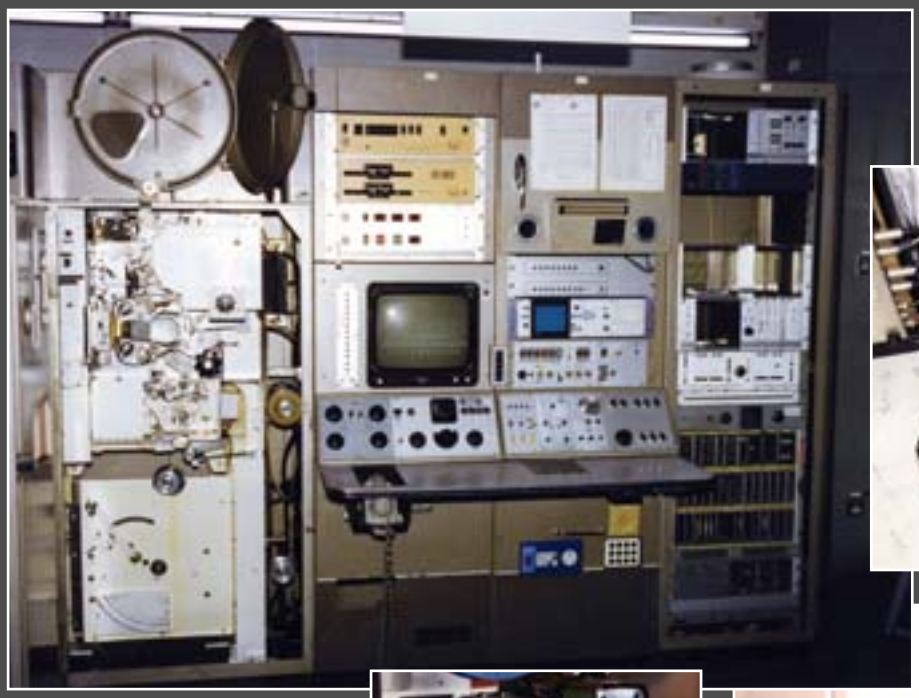
Where did you hone your engineering skills?
I had no TV experience when I joined the BBC, so I learnt everything at Evesham (the BBC's training centre) and on station. I don't have any formal engineering qualifications because I joined the BBC straight from school. In fact, I was quite nervous when I was told I had got the job.

What equipment did you work with at the start of your career in the BBC?
In the telecine department we had a mixture of Rank Cintel Mark I, II and III machines. Mark I was the polygonal prism machine, of which there were only three left in the department, two of which were about to be decommissioned. The Mark IIs were twin lens machines. Most were on the second floor transmission area (at TV Centre) containing a mixture of 16mm and 35mm. The 35mm machines were all in pairs (except for TK24); this made it very convenient for multi reel transmissions, for example feature films consisting of say five reels. We had to do live changeovers between reels, which of course was nothing special as it was done in the cinema for years.

Live TK transmissions went on almost to the end of the 1980s. In fact, I did the very last ever telecine transmission on 29 November, 1988. It was the Tuesday western on BBC 2 – *Apache* staring Charles Bronson. That was a sad loss in my opinion because we were producing some of the best pictures out of TV Centre. From December 1988 onwards transmissions were limited to VT only, so the telecine department's function became very much one of post production.

Down in the dungeons of VT we still had two Ampex AVR2s in each of the two transmission areas and one Ampex VR2000 (two-inch quad machine) left in service, of which I made myself the unofficial custodian. In fact, I also did the last ever transmission on a VR2000 as well, an *Open University* mathematics programme one Sunday morning.

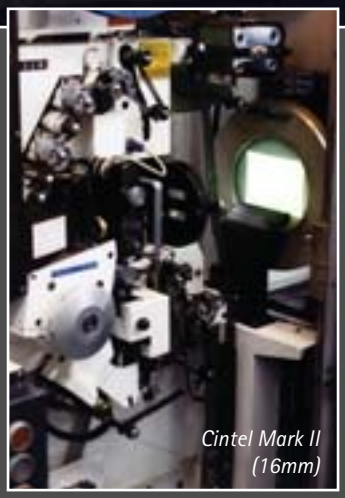
I left TV Centre in 1990. I was working almost exclusively in telecine at that time. But, I got a telephone call from an old colleague working for TVi in Wardour Street. He said: "Would you like to come and have a look round?", and I said: 'Oh yes, why?' "Well I've been given the job as



TK32 BBC TV Centre London

Shibaden SV700

Lucy Woodward holding her portable Akai VT150



Cintel Mark II (16mm)

head of telecine and I'm building a team around me and wondered if you'd like to come and join it."

I went and looked. I ended up spending 18 months at TVi and left them in 1992. I decided I was going to work for myself and I would never be an employee ever again, even if I was as poor as a church mouse, I didn't care. And I was, and I didn't, and here we are.

Did you make a conscious decision to buy every format of video recorder there is?

It was a conscious decision in so much as I was fascinated by them, and liked tinkering with them. If I saw one, and it was a fiver, I'd have it.

The first machine I bought was probably an EIAJ (Electronic Industries Association of Japan) machine and I think it was a Sharp that I found in the Notting Hill Music and Video Exchange for £5. I didn't have a purpose for it when I first bought it.

Then the next one was a Sony CV2100 and a Shibaden SV700 and then a Philips N1500 – the old original cooker clock version! I was given a whole load of stuff from a school, including a colour EIAJ machine, and then I really started going berserk and someone gave me a RCA TR4. That was the first quad machine I owned. I had that in my conservatory! It had a ball bearing head and it was lovely.

I've had some bargains in my time – for instance I bought two Sony BVH2000 machines, which I think are the most reliable and consistent one-inch C-format machines ever made – I paid £10 each for them! These machines must have been worth about £30,000 when they were new.

When did all the collecting turn into a business?

In about 1988, but it never really took off, even when I started doing it full time in 1993/4, because there were still quite a few people out there who had machines and offered transfer services.

I missed out on some of the big work because TV companies had their own machines and were determined to do it themselves.

But, over the years, two things have happened: I like to think that I've built up a reputation, and other people have become increasingly uninterested because the work is fiddly and sometimes a complete pain.

People don't have the patience these days, but I enjoy the challenge. Also, there are not the skills left any more.

Presumably they are all quite reliable?

Oh yes. These machines were made to last. They were not throw-away things. Take the Shibaden SV700 (half-inch machine). If you stuck a screwdriver in the head drum the screwdriver would probably come out blunt!

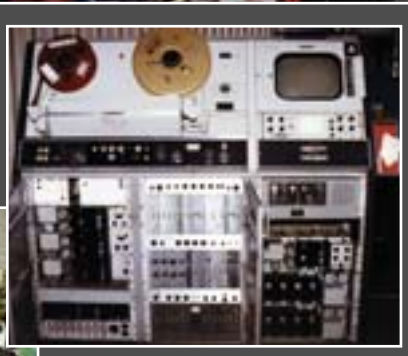
Seriously though, if you do encounter faults, generally, they are simple power supply faults, sticky relays or dry capacitors. The video heads are the biggest problem because in some cases (the original Philips cassette formats spring to mind) they would be virtually impossible to replicate. I squirrel heads away like there is no tomorrow, but there will come a time when certain formats will become extinct.

Have you discovered any interesting material?

Because I am extremely nosey and very interested in the mechanics of television, I always hunt through tapes for extra little bits. I did some work on the BBC quad archive. Part of it was for BBC Wales. I remember

Sony BVH2000

Portable Shibaden



Ampex VR2000

Head drum mechanism of Philips 1700

transferring the contents of one tape in particular: having successfully completed the programme I was expecting on the tape, I was delighted to discover on the remaining 40 minutes of what I thought was a blank tape was a bit of *Top Of The Form* followed by a complete episode of the *Goodies* – an episode missing from the (BBC's) archive.

It was a low band recording, a mode only suitable for monochrome signals, but someone in their infinite wisdom had connected a colour signal to the machine and it had actually recorded colour sub carrier.

I managed to tease as much out of it as possible and I got quite a reasonable transfer and in fact it has now been released on one of the collections that Network has issued on DVD.

What's your most precious machine?

My pride and joy are my two VR2000s, which I maintain is the best video recorder that has ever been made in the entire history of mankind. Made in 1965. Bloody marvellous. We got those about three years ago and we've got about thirty or forty sets of Mark-Ten heads. I am always on the lookout for spares – you might see me lurking around the odd skip. And I have many friends around the country who keep a look out for me.

If I may voice an opinion on a subject more closely associated with your readers, I think the EMI 2001 was the best camera ever made. Flood the studio with light and put an EMI 2001 in there, record it onto a VR2000; wow!

What do you think of current archive material?

Look at any archive material that is in BBC programmes now; firstly, I believe, they double ARC (aspect ratio correct) it. This screws the picture up completely. It's almost as if they deliberately degrade the old pictures. Call me paranoid, but I know what a first or second generation quad recording should look like.

Far too liberal a use of noise reduction as well, bleeding all the life out of the pictures. I've seen it done. You just end up with flat pictures. Skin tones are gone. It is all AK (aperture correction) and no definition. I'm sure many of you will know what I mean!

What is your opinion of modern tape formats?

We used to master to D1; especially feature work at TVi. D1 was superb, a stunning format and not compressed. I still think it is the best digital format produced to date.

The most common format that I record onto is Betacam SP. I have D3, but I never record on to it. If people want DigiBeta I can hire it in.

Within the work that I do, if someone wants to produce archive masters, I'd say use Digital Betacam. I record onto whatever people want. My motto is: 'I will get off the tape what was put on.' As long as it hasn't been damaged beyond redemption. What you do with it afterwards is up to you. (She doesn't grade the pictures in any way. Indeed, her website (*http://www.videoark.co.uk/*) boasts: "Whatever is on your tape, we will reproduce it faithfully as it was recorded, warts and all. You won't find this service anywhere else.")

Is there a machine that has eluded you?

Ikegami 2/3-inch format. That said I've never had enquiries for work for one. But, it would be nice to have one. (John Rossetti responded that his father-in-law has one, so the search may be over....).

What is your dream job?

Working on collections of old TV programmes. Some of my favourite stuff has been election broadcasts from the 1970s. It was a massive collection of off-air recordings from BBC and ITV news transmissions. I'm nuts about TV history.

The test card is one of my loves (what an admission!), I actually belong to the Test Card Circle. Here's another admission: I have an electronic test card generator that generates three different versions of test card F and all the black and white cards as well. I've also compiled and produced commercially available CDs of test card music.

How long will there be video tape in this industry?

I really don't know. There is that great human thing about resisting change, and fear of the unknown as well. How long is a hard drive recording going to last before it corrupts? OK – you've asked me the question and I'll give you my honest opinion. I'm a great fan of magnetic recording tape. It's been around for a long time. It has stood the test of time. I don't believe there is a more reliable means of recording and storing sound and vision signals. Can I be any more plain than that?

XDCAM HD Review

By Ged Yeates

Whilst HD editing has become affordable, high quality HD cameras remain expensive. HDV is a visually-compromised low-end format unacceptable to most HD broadcasters. This has left no option but to shoot on the high-end HD cameras. However, Sony's latest HD camcorder significantly lowers the cost of HD acquisition whilst being acceptable for HD broadcasts. GTC member Ged Yeates takes a look at the PDW-F350 XDCAM HD disc-based camera.

With HD broadcasts now available in the UK, from Sky and others, HD production is gathering momentum. Naturally, broadcasters and producers want to make programmes for affordable budgets, preferably for no more that SD.

High-end productions are dominated by two main formats: Sony's HDCAM and Panasonic's DVCPRO HD. There are other formats, but in practical terms HD camcorders lend themselves best to affordable production as they can be used in the same way as DigiBeta or DVCAM. Very high-end HD cameras require complex set ups and often disk-based arrays to record onto and are more suited to the slower pace of drama, often requiring a picture grading process to achieve the final image.

The PDW-F350 XDCAM HD camera is relatively affordable and, according to Sony, sits between HDV and HDCAM. Like HDV it uses MPEG compression, but one that the Discovery Channel has found can survive the HD broadcasting chain; it previously rejected HDV on technical grounds. This makes the F350 an interesting camera and I was intrigued to see how well it performed.

I have had my DigiBeta camera for nearly seven years and know exactly how it will perform in various lighting and weather conditions and how the pictures will look. So that is what I compared the F350 to.

The F350 costs a lot less than a DigiBeta, so I was expecting less of its performance. Obviously, there is a huge difference between HD and SD, so I expected big gains in resolution, but would camera operation be better or worse?

Initial impressions were good. I liked the compact size and was surprised by how light it was. The design is reminiscent of the Sony DSR-450 DVCAM camera, but the build quality seemed not as robust as DigiBeta. However, despite certain components being plastic or other lightweight material, the camera proved to be far from flimsy in use and felt more solid than expected.

The viewfinder assembly is firm, but definitely a lighter build quality than on the DigiBeta range. As someone who changes lenses regularly when shooting, the quality of the lens mount and locking lever concerned me as they feel very lightweight – I'm sure time will prove their robustness one way or another.

I was relieved to discover the F350 comes with a two-inch 16:9 viewfinder, as I dislike 1.5-inch viewfinders. The review camera was fitted with the monochrome CRT viewfinder.

Taking control

The F350, like the DRS-450, has no optical colour balance filters. The Filter wheel is purely for ND, and white balances are performed electronically. Preset white balances are still available with a 3200K default. If a preset of 5600K is required, a dedicated switch has to be pressed, which illuminates when selected.

The power save, gain selection, camera output and white balance memories are located in familiar places and easy to find. The menu switch is now much more accessible. As many features require menu selection to activate or turn off, I found its location helpful.

The familiar timecode, audio and VTR display no longer exists on the F350 and the only way to view them is via a flip out LCD. This display is crucial to certain camera functions and is probably the most vulnerable part of the camera.

The LCD can be protected by pulling it away from the body at 90 degrees, flipping through 180, then pushing it back into the body. Alternatively, it can be used at 90 degrees to the body and tilted to face

forwards or backwards. The display automatically inverts if you twist it through more than 180 degrees.

The LCD is low resolution and the colour and exposure far from accurate, but they convey a general impression reasonably OK, though I wouldn't rely on them. The LCD can switch between displaying the viewfinder output, clean video display, or timecode, audio and data. Brightness can be varied between the three levels, but in very bright light even the brightest setting can be difficult to see well. It also acts as a replay monitor during playback.

On the left rear side of the camera a large panel conceals the timecode and audio monitoring controls as well as buttons related to use of the disc during replay.

Discs are top loaded and opposite the disc opening mechanism are the transport control buttons, covered with a familiar push and lift panel. At the rear are two XLR audio inputs, an external power input on a 4-pin XLR, audio out on a 5-pin XLR, remote control input, a hi-rose 12v power output, an HD-SDI output on BNC and a FireWire output. There is also a memory stick slot for updating the camera's firmware and storing camera set up files.

The onboard camera mic is stereo and the front XLR input is now 5-pin. At the lower front part of the camera is a socket for lens cables, recording on/off, white/black balance and shutter switches and a rotating menu selection control.

The right-hand side has several BNCs for genlock, timecode in/out and video out, which can be either composite (SD) or the Y channel of the HD component signal. Just below the carrying handle is a 12v power D-tap socket allowing up to 50 Watts to be drawn, which can be switched to supply power manually or automatically when recording begins.

A Cine Alta badge hints that there is more to this camera than meets the eye. Cine Alta is Sony's name for HD cameras that can operate in 24p frame mode. The F350 can shoot in HD 25p, 50i, 30p and 60i as well as in SD in PAL and NTSC frame rates in either interlace or progressive in 4:3 or 16:9 albeit at DVCAM quality.

How good is it?

Powering up reveals a reasonable picture in the viewfinder, but no different than shooting SD. The camera is very comfortable on the shoulder and the shoulder pad is easily adjusted. It is very light, so will be popular for handheld work, though I found its lightness caused some problems in certain weather conditions!

The review camera came with a Canon HDGC KH20x6.6 KRS lens, which I had a lot of issues with, initially causing concerns about the pictures.

One big difference between the F350 and high-end HD camcorders is that it uses three half-inch CCDs rather than two third-inch sensors, so the lenses are different. A supplied adaptor allows two third-inch lenses to be mounted but with cropping of the angle of view. The half-inch lenses enable the full field of view and I found them to be more useful when shooting.

The Canon HDGC KH20 is an affordable, but basic, lens and Canon produces several other half-inch lenses that are much better choices for the F350. Fujinon also produce several lenses for the F350 and I was able to try out two of them: the XS 17x5.5 BRM and the XS 13x3.3 BRM, which gave the camera a new lease of life.

The F350 has several new features that I really liked. It can shoot time lapse and can also record in an overcrank and undercrank style. The record speed can be varied by selecting a custom frame rate. When shooting in a PAL area I could only get this function to work when shooting in 25p mode and it allowed me to select recording from four frames to 50 frames per second. In NTSC areas 30p or 24p must be used and between four and 60 fps can be chosen.

The slow motion is beautifully smooth and far superior to slowing down video shot in real time, so this is a fantastic feature and one I was soon hooked on. The fast motion is also excellent and again superior to speeding up real-time footage. At frame rates below 25 in 25p mode, the picture in the viewfinder is very odd as it displays strobed images, but the recordings are fine. The same applies when shooting 24p and 30p. When shooting above 25 fps (or 24 and 30) you use more disc space, and 50 fps footage requires twice the amount of disc space, so don't get caught out. Vertical resolution is reduced when shooting higher than your base frame rate, but it still looks better than traditionally slowed down video shot in real time.

The time lapse is superb and, though slightly limited in its flexibility, produces great results. You can select the interval between pictures being taken from one second up to a maximum of 24 hours, followed by the number of frames at each interval, between one and six frames. Next, choose sequence duration, the default being continuous, where you manually stop, or a fixed duration of 50, 100, 200, 500, 800 or 1000 frames.

The time lapse images in 25p were super smooth on skies and again superior to shooting continuously in real time, then speeding it up in post. 24p time lapse was a bit jerky looking, and best avoided, and 30p was very smooth.

Another feature, frame accumulation or slow shutter, emulates the effect of slow shutter speed as used in stills photography. It gathers light over a certain number of frames (from one to eight, or 16, 32 or 64) before producing a single frame of video. For example, the blurred water effect photographers

XDCAM HD frame grabs

can produce with a slow shutter can be simulated, but with moving pictures. On a waterfall it achieved a ghostly-looking water effect, but with quite jumpy looking motion. I didn't like it. However, I did find it useful filming inside a room in very low light. Normally, if unable to light a room there is no alternative but to use gain, resulting in grainy pictures. A static room shoot using the F350's slow shutter gave bright, noise-free images with good colours. I found it useful in such situations, much better than gain, but you do need a static shot. That said, I tried a slower frame accumulation on a hockey match and the ghostly motion was quite effective so there are creative possibilities with this.

Also useful is picture cache. This allows recording in memory to continuously loop, selectable between two and twelve seconds. I have this feature on my DigiBeta, which has an eight second maximum and it helps ensure you never miss recording anything. I still enjoy pressing record after something has happened, so it is great to see this on the F350.

One thing I like on the F350 is its four assignable switches: two next to the ND filter wheel and two on the handle, which enables instant access to your own preferred camera functions.

The F350 has a full auto shooting EZ Mode, as found on a consumer camera, but I doubt any professional cameraman would use it as far better results are achieved by manual operation.

The camera does have an auto white balance mode, ATW, that is on the cool side. A nice feature is shockless white balance. It's not new, but it is useful. It allows you to manually switch between white balances and to ease the transition so it looks more natural. You can select the transition to be one, two or three seconds, which is useful where you move from a daylight exterior into a tungsten lit interior.

Compression schemes

The F350 uses XDCAM optical disc media, but prior to recording in HD it is necessary to select the recording quality. Three levels of compression are available for HD, but only the highest quality, HQ, truly survives the rigours of post production and the HD broadcasting chain. HQ uses MPEG long GOP (group of pictures) compression at 35Mbs, which typically records about 60 minutes on a 23GB XDCAM disc. Lower MPEG HD data rates can be selected, with SP allowing about 90 minutes recording and LP enabling two hours. In SD it records about 85 minutes at DVCAM quality.

XDCAM discs require formatting before recording starts and though this is reasonably quick it is still too long compared to inserting a DigiBeta tape. If you were shooting something vital you could miss a lot of it. This means having to pre format discs before heading out on a shoot as formatted discs are load quickly and recording commences with minimal interruption.

Apart from formatting, disc is liberating after the linear tyranny of tape and very user friendly in terms of accessing recordings, deleting unwanted clips, and never having to worry about timecode breaks and tape backspacing. It is possible to go straight into record even if you are viewing a clip recorded earlier as there is no need to locate the end of the last recording.

The disc recorder has minimal moving parts compared to tape transports so is quieter in use, but it does have an audible "thunk" as recording starts, so you can forget discretion if you want to secretly start recording! Also, it is not entirely possible to hide that you are recording as there are just too many lights showing that it is taking place and not all can be switched off, some black gaffer tape may need to be stuck over certain parts of the camera; providing tally light covers and on/off tally switches is a bit of a wasted effort.

The first thing I noticed when using this camera was that it is not as sensitive to light as my DigiBeta camera and was a lot noisier in darker picture areas. One thing I have got used with DigiBeta is its ability to shoot in a wide variation of conditions. I usually shoot documentaries and current affairs, so I need to produce good pictures in any weather and any light. It must also have a huge dynamic range with good highlight handling with low noise when gain is required.

It is perhaps an unfair comparison, as the DigiBeta is pretty much optimum for SD cameras and it is only producing a picture a third of the size of the F350. But, while HD CCDs are a big step forward, they involve some compromise; with lower signal to noise ratios compared to current SD cameras and reduced light sensitivity.

To be fair, the expensive HDW-750 HDCAM is as bad, so it's not really a black mark against the F350. HD CCDs are packed with a huge amount of pixels compared to SD chips, so the sensitivity loss and higher noise is consequence of the huge resolution increase.

Using the F350 outdoors on a grey, gloomy and very windy day, the light weight of the camera caused problems as it moved a lot in the strong wind despite being mounted on a heavy duty tripod and head. Admittedly, not everyone will shoot in these conditions, but they are often encountered in Northern Scotland and Scandinavia (places I shoot). I managed to resolve this by using heavier batteries and a better lens, but those doing a lot of handheld camera work will like its weight.

The F350's pictures were not bad considering the gloom, but with reduced dynamic range and noise in the darker picture areas. However, the HD picture is much nicer to look at compared to those rather wee SD images. Wide shots take on an epic and detailed appearance and the whole experience is more cinematic.

I did notice some green and red fringing on highlights and was able to reduce this when the Canon KH20x6.4 lens was replaced by the Fujinon XS13x3.3, though some fringing was still evident. I suspect some of it is coming from the CCD prism. When exposing for the foreground causes the brighter areas to burn out, I noticed a thin dark green/black line appearing on the edge of the dark to bright transition. I used to see this a lot on a Beta SP camera, but the effect had disappeared on DigiBeta. The line obviously occurs in areas of high

contrast transitions between adjacent pixels. It's not something I've noticed on HDCAM cameras, so maybe a characteristic of the lower cost of the F350. It is by no means horrendous, being more subtle than it was on SP, but it is there.

In low light, the noise from the CCDs is visible, and using more than +3dB of gain looks noisy. You could push it +9dB but the noise is very obvious. On DigiBeta I have been able to shoot on +18dB and get usable images..

It is also possible to induce a smear from the F350 when shooting very strong highlights, such as a bright sun. But, it did not occur that often, so it is possible to shoot scenes without it being intrusive.

I decided to push the low-light performance by filming a singer and guitarist in a low-lit room against black as this emulated the kind of

conditions found when filming a documentary in a small club where it is not possible to light the location. I set up a very low output key light and used HD 25p. Despite my reservations, it worked well. The 25p HD image is very nice, lent itself to the subdued atmosphere, and produced a richer image, which looks unlike ordinary video, that I rather liked.

My concerns about noise in the blacks were unfounded. Although noise was there, it was far from intrusive. The camera allows fast access in the menu to selecting different gamma curves and one of these was perfectly suited to the look I was after. In fact, one observer thought the pictures looked beautiful! I like shallow depth of field and had been concerned this may be difficult to achieve on half inch CCDs, but again, despite an increase in depth of field, it was not as big an issue as I expected. With the iris wide open and using 0dB gain setting there was lots of scope to pull focus.

One thing about shooting in HD is that focus becomes very demanding. Shooting a static interview proved that even slight movements of the interviewee's head would cause them to go slightly out of focus, so following focus is required at all times. I enjoyed this new challenge, but the Canon KH20 lens made this difficult as its focusing action was a bit too loose for my liking.

When shooting in HD and progressive you need to adopt a different shooting style to SD interlace. Because you are recording a huge detailed picture it is not necessary to move the camera as much as there is a lot for the viewer to take in. I found moves had to be graceful as fast pans and crash zooming looked distracting and blurry and more suited to small screen viewing.

Using the F350 is like using an SD camera as the viewfinder image is similar and you need to remind yourself that the image being recorded is huge, so any shake or focusing errors will be magnified more than you think and gung ho hand-held operation will likely induce motion sickness in viewers. A more considered approach works well with HD as the big pictures are impressive and can be held for longer periods.

I recorded a fast moving hockey match at 50 fps and the slow motion was excellent. I even did a bit of hand-held shooting at 50 fps moving along the touchline and walking around players and loved the results. I could not resist a wide locked off shot at four fps, resulting in very usable fast motion. I found that 40 fps looked very graceful on the fast moving hockey players.

I recorded a few dense shots of the long fine blades of marram grass blowing in the wind that would be demanding of the MPEG codec being used (35Mbps HD) and was impressed. The recordings were good. Fine detail and movement will not be an issue with this camera as the HD image on replay was smooth and excellent quality.

I did not have the opportunity to test out the cameras ruggedness, but I read that on the filming of Land Rover's G4 Challenge the camera encountered a lot of tough conditions and the production company say it was reliable and robust.

Despite my gripes about noise, fringing and highlight handling, the F350 is a good performer and produces nice images that look impressive. Its extra features really expand your creative potential and I think you get a lot of camera for your money with the freedom of disc recording over linear tape.

Work flows

The F350 has a FireWire (400Mbps) output, which allows HD to be output as downconverted SD DV video with embedded timecode, enabling SD editing or SD offline, or the FireWire can be switched to FAM mode, which allows native XDCAM HD MXF file transfers. I tried this out with Sony Vegas 7 editing software and it was simple and faster than real time. Also, XDCAM HD allows the transfer of low-resolution proxy files at high speed, enabling fast editing and a pain-free auto conform at full resolution direct from the camera. Then the full resolution edit can be transferred back to the camera. It works effortlessly.

XDCAM workflow is perhaps an entire review in itself, so I have only given a brief outline, but what impressed me was that no expensive VTR was required to capture full resolution footage with accurate timecode and the ability to lay it back for archive. It was also liberating not to endure real-time digitising when using FAM, but in SD DVCAM mode you will be back into the realms of real-time transfer.

Conclusion

The F350 is a good camera and offers great value with good pictures and the extra bonus of not having to invest in an HD VTR for editing. I did get used to the lower sensitivity, but was mildly disappointed with the highlight handling. However, this camera can be purchased for under £20,000 and it is HD. I enjoyed the non-linear freedom of recording onto disc and I adapted to the lighter weight of the camera and found the extra features such as time lapse, variable frame rates, slow shutter and the ability to shoot in various formats, and even in SD if required, quite amazing!

The F350 is an elegant looking camera, with user-friendly operation, and has a lot to offer whilst producing impressive pictures. I think this is a camera that will enable HD production at similar cost to DigiBeta but with the advantages of non-linear workflow and higher picture resolution. After a few weeks of use, I like it!

Fact File

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Zerb Basics: Lighting 3: *The Great Outdoors*

By Tony Grant

This article is a continuation of the series on lighting. Whilst there may be some slight overlaps with previous material, I am making the assumption that you have already read those articles. If in doubt, refer to the *Zerb basics* index below to fill in any gaps in your memory. Please also reread, note and inwardly digest the safety section in the first part of this series on lighting (*Zerb* 63, Spring 2006).

Light's role in this instance is to provide the catchlight

You must be able to control an onboard light's intensity

Part 2 left off with our reporter (see note below???) walking backwards and forwards from outdoors to in. Whilst we're standing out here, do we actually need to light anybody or anything outside? With the sensitivity of today's cameras, there's certainly no need of any extra light in order to achieve an acceptable exposure, is there?

All right, just testing, we all know that 'acceptable exposure' and acceptable pictures are not necessarily synonymous. And yes, we invariably need some form of lighting outside, which is a good cue to remind you of a quote from Nestor Almendros, (*http://tinyurl.com/ylz2fb*). "You have to give an impression of reality, not be a slave to it." Plus, he adds: "Ensure that the keylight produces a catchlight in the eyes, in order to bring 'life' to the face."

Even outside, we can find ourselves in a situation where the eyes are 'dead' without some form of additional light. More often than not, it's on that grey, overcast day, with bags of softlight from the sky, and no life or energy in your pictures whatsoever. It's up to you to provide that extra 'zing' to bring sparkle to the eyes.

Onboard light

This is one of the few instances where the onboard (or on-camera) light can earn its keep. It's ideally placed to push the right amount of light into the eyes and establish the all important catchlight. It is akin to the use of fill in flash in photography, and it too can add a degree of fill to the face. Mind you, the fact that it's on the camera means that the level of illumination from the light is determined by the camera's distance from the reporter. Since the light's role in this instance is to provide the catchlight, not to make the picture appear illuminated (its fill effect may or may not be noticeable, or even beneficial), you must be able to control its intensity.

When working outside, I find that the best material to use for adjusting the light level is spun (this is assuming that your onboard light is a basic one, with no dimmer control). Spun can be folded, to increase its thickness, and thus decrease the amount of light that passes through it to the reporter's face. Its other advantage is that it doesn't 'rattle' in the wind, as a gel (ND for example) might otherwise do in its place.

Having recommended its use for a 'zing', there are two potential problems using your onboard lamp. First off, if you are working at too great a distance from your reporter, once you have fully spotted the light, it cannot provide any extra level. You can either accept the lessening of the effect (certainly not ideal) or move the camera closer to the reporter (or ask the reporter to stand closer to the camera). Since lithium and NiMH batteries have taken over from NiCads, the onboard light has

Spotted light does not fully illuminate the entire frame

been reduced in wattage. Unfortunately, these newer batteries are unable to provide sufficient amperage to run both camcorder and light if the light is in excess of about 30W (for standard 12v DC equipment).

Some manufacturers have attempted to ameliorate the situation by providing 30W battery lights with a tighter beam pattern (more spotted) than previous models. This brings us to the second problem. With spotted light, which does not fully illuminate the entire frame, it's very obvious if the reporter wishes to walk into shot, as there will be a noticeable hot spot. The same applies if you wish to pan from an opening frame to find the reporter, the hot spot will follow the camera pan. Only you can judge whether this is an acceptable trade-off between becoming a visual distraction and/or providing the requisite 'zing'. Otherwise you will have to persuade your production to adjust the shot and its staging to allow you to move the camera and reporter closer to each other in order to negate the hot spot by putting diffusion on the lamp.

The other aspect to staging and framing a shot when you have a hot spot produced by the lamp is to ensure that you adjust the position of the lamp on the camera so that its beam is centred on your reporter. Well, no respectable cameraman frames the reporter dead centre for a piece to camera, do they (thirds rule OK)?

Reflected glory

Having mentioned fill with respect to the onboard light, the direction and strength of sunlight often mandates a higher level of fill than the light can provide. In the same way that I could hear mutterings of "What about using a reflector?" coming from the readership in the first lighting article (yes, my highly attuned hearing comes from writing the book on audio). I can just detect the same murmurs arising now! And, as I also said in the previous article, I wouldn't go shooting anywhere without my reflectors.

When working out of doors, I usually prefer to use a white reflector, especially to provide fill in direct sunlight. That is, as opposed to a silver reflector (who said beachmat?), which can prove to be too harsh in high levels of sunlight, and thus make the reporter squint. Whether you like him or not, the end result will not please the viewers or, more importantly, the production who booked you for the shoot, and someone else will get the job next time.

When it comes to reflectors, size is everything, and bigger is better, certainly as far as the amount of fill is concerned. But 'bigger' places constraints on handling and positioning, proving to be exceptionally frustrating, and often impractical, in windy conditions. In the days when large sheets of white polystyrene were used as reflectors, I recall one exceptionally windy day when the spark was left holding two small pieces of poly in each hand as the main board went hurtling off down the street. Whilst I love the type of reflection you get from a piece of poly, if you do use one, make sure you gaffer all the edges to strengthen them. This will help keep it in one piece while you're lifted off your feet and hang glide down the high street!

Using a reflector, of course, the camera and reporter do not have to be 'glued' to each other to maintain the required amount of fill. The reflector is positioned to provide that, and as it's almost certainly being held, it can easily be moved to suit the circumstances. Having said that, I don't mean to imply that it should be necessary to keep moving it during the shot. The beauty of using a reflector is that as the sun's intensity varies, due to cloud, so to does the amount of reflected light, thus producing an entirely natural variance of illumination to match the degree of sunlight.

Does it also provide the all important catchlight? This will depend on the angle of sunlight with respect to the reporter's position, and how frontally you can position the reflector, assuming this position provides the correct degree and coverage of fill. I have occasionally had to use a second reflector to provide the catchlight, especially with the sun at about 90 degrees to the reporter's eyeline. In this instance, if you only have a white and a silver reflector, you can use the silver one to the side, and the white more frontally placed to provide the catchlight. But, using a reflector or two presumes the presence of someone who can hold it/them, and pay attention to the effect they are producing (as opposed to also trying to make a note of questions and answers or follow a script for example).

Holding a reflector correctly, in a static/stable position for a considerable length of time, is an important operational task, and needs a clear understanding on the part of the 'holdee' as to what's required. It's all very well having a

Reflectors can easily be moved to suit the circumstances

laugh at the trainees attempts to refold it, but unless they can hold it properly in the first place, a wavering amount of fill can be both obvious and objectionable, not to mention the disappearing catchlight. In these circumstances, coaching and experience are the order of the day, and you need to allow time to administer it when necessary.

Hand bashing

When a location crew had at least one spark working with them, there was always a choice of using the hand basher. More often than not it was a 600 – 800W tungsten lamp running off a 30v battery, and in the hands of the spark it provided a relatively sophisticated method of close working illumination and/or fill depending on the nature of the job. Although it was known as a hand basher, and had a pistol grip under the lamp head, the base of the pistol grip had a hole for a spigot, and a stand was carried, together with at least two battery packs and a small assortment of gels and diffusion. Thus it could very speedily be placed as a key light, a fill light, a kicker; you name it.

For speed of working in close quarters, this method remains unsurpassed, as the spark knew exactly where to place the light without having to be told, so you could be up and running immediately you set foot on a location (since you also had a sound recordist as part of the crew). With regard to the reflector, I said that it needed an experienced pair of hands to hold it correctly, and this is equally true of the hand basher (if not more so). These types of lamp are still available, and provide a great deal more 'zing' than the on-camera light, but working on location they must be manned from the point of view of Health and Safety, and not simply left out in the open on a stand (unless securely rigged/fastened on a stable structure, inaccessible to the public). So, whilst I love the flexibility this lamp provides, I hesitate to recommend its use by anyone other than a fully qualified and experienced spark.

Before I leave this topic, I should also mention that quite a few of the small battery lamps in use today tend to be daylight balanced (see Daylight lamps below). If you can afford it, I would certainly recommend this type of lamp as a battery operated location light.

They have that extra 'oomph' when working in daylight, and at night you can use CTO gel to convert them to tungsten, possibly welcoming the slight reduction in output that results. The downside to their use is that they take a high voltage to start, thus repeated on/off cycles drain the battery quickly, and so it's best to leave them running for a couple of minutes rather than turn them off.

They also require a finite amount of time to achieve their working colour temperature (but that's usually less than a minute with modern lamps of this type).

Book the biggest light you can afford – in this case the ARRIMAX 18kW

Batteries

When using battery lamps, current drain can pose a problem, so ensure that your batteries are fully charged, and in peak condition. Always check that you are using the correct batteries for your lights so that you do not damage either the lamps/ballasts or the batteries themselves.

Several lights

Although this article is aimed at single camera working, there will be times when you need to cover a large area outdoors. I cannot possibly cover this topic in any great detail, but I can at least mention some of the pitfalls to be avoided (holes I've had to dig myself out of). More often than not, you will be contending with daylight, which can be anything from a dark overcast day needing a lift or a 'zing' to intense sunlight, needing plenty of shadow filling (otherwise, see Night below). The sun's direction/elevation during your shoot, plus the weather conditions are of the utmost importance. Going into a large area without a recce is asking for trouble with a capital T (and I'm no slouch when it comes to any aspect of T).

Safety wise, I would veto any ideas about running anything electrical via a power cable from a 13A mains with domestic plugs/sockets to an outside location. You should always use the proper weatherproof connectors at a minimum, although if you are using less than 3kW, you could use a jumper lead with the Ceeform connector to start with. However, using an ordinary domestic circuit, you may face problems with a voltage drop over a long cable run, and I would suggest you don't attempt to work further than 60 feet (20m) from the mains socket. Do not run cables from several sockets unless you can be absolutely certain that they are on the same phase.

More power

By far the safest method of working with exterior lamps is to power them from a generator. I would also go so far as to insist that you book a sparks with the genny, so that you have someone who can both assist with your lights, as well as looking after the genny. When you add up the amount of power you need for a genny, allow for extra kit, as other equipment is often produced on location that needs power (yes, always remember my kettle, if nothing else). Daylight lamps also require extra power (over and above their nominal rating) to be available, especially when first turned on.

Q. How many lights do you need outside? A. How bright is the sun? I thought I'd cracked it for a live broadcast from Great Yarmouth beach when I used a 4kW HMI. Oh dear me no! Even at eight in the morning, the full sun over the sea completely overpowered the HMI, it might as well not have been on, for all the good it did (although

had I been able to get it closer to the action... but that's another story). Fortunately, I was able to work at an angle to the sun, and so managed to get some detail in the picture (plus there was some reflection off the sand, which provided a bit of fill, thank goodness).

The moral of the tale is, book the biggest (highest wattage) light you can afford, since, as I said earlier, you can always get rid of light if you've too much, but if it's not enough... gloom, doom, and despondency abound. Of course, you can always use daylight, and reflect or diffuse it with suitable materials. Absolutely gigantic nets or even mirrored surfaces can spread an amazing amount of light around (if the sun's doing its job). However, whilst these large surfaces can provide excellent coverage and a degree of diffusion, they are 'allergic' to extreme weather conditions. They act just like a sail on a yacht. So, if you are using them, note the wind speed and direction as well as the amount of sunlight given out by the Met Office. It's one of the better things to come out of computers, being able to access the local forecast (although as yet they don't vouch for its accuracy).

However many lights you use, you should always make allowance for extreme weather conditions, and ensure that all cabling and connectors are waterproof, and not routed in gullies, or other areas where water may collect. At a minimum, sandbag all stands, and if conditions are windy, heed the sparks advice, and do not try to continue working with lamps that are swaying in the wind. If the lamphead can be tied off, or otherwise secured, then it may be safe to continue, but a swaying lamphead is a serious danger, as well as not illuminating a precise area all the time!

Day for night

Whilst this topic was previously covered in the article on filters (*Zerb* 57, Spring 2003), I've included it here as several aspects in it are reliant on the use of lighting to achieve the desired effect. In order to produce a convincing night time feel to your pictures, there are several points to bear in mind before you begin, including script requirements, action area, number and type of artists, location and prevailing lighting and weather conditions, together with the amount of post production resources available.

You might wish to consider using a DFN (day for night) filter. There are several available, but basically their visual effect is relatively wavelength specific, lending an overall blue tone to pictures whilst passing some red wavelengths to improve skin tones. Some may also require post

Daylight lamps

HMI, MSR, CID, CSI: These are daylight lamps, and consist of a lamp-head fed via a ballast. Due to their efficiency, a 2.5kW HMI provides over twice as much light output as a 2kW Blonde. (Comparisons cannot be too accurate due to variables such as bubble age and voltage stability. HMIs especially can suffer from poor performance, ie colour temperature irregularities, if the voltage drops. Also, if working in tungsten surroundings, the HMI will need to have an orange filter, which naturally reduces its light output.)

Higher powered HMIs are available, but require specialised power sources, eg a generator. They are the most practical lamps available for daylight work, due to both their colour temperature, and their efficiency. Both the lamp-head and the ballast are heavy, and require two men for safe rigging and operation. The weight of the combined unit means that lamp repositioning is a cumbersome and time consuming affair. Older lamps can take several minutes to reach operational colour temperature.

Checking light levels
Picture courtesy of www.cirrolite.com

Setting up the Bag O Lite. Picture courtesy of www.cirrolite.com

production treatment of the image, probably further colour manipulation, so do seek advice before using one! It's not something I've used myself, as my own preference is to shoot on the tungsten filter position, use tungsten light to illuminate people in frame, and then underexpose by at least two stops.

However, when you use tungsten lamps in daylight, you still have to make them appear as 'natural' sources of light. Thus, it should appear visually as though their light is coming from street lights, car headlights, torchlight, or other 'naturally' occurring sources. Added to this, since you have underexposed you may need to use quite high levels of illumination, and achieving the correct balance between foreground and background can be frustrating and time consuming, especially if you are facing varying levels of daylight. As the daylight changes, so too will your artificial light to maintain a balance, and you may find it necessary to have the lamps on dimmers for ease of operation. Depending on your location, you may also find it necessary to power your lamps using a generator, especially if you need high levels of illumination. Perversely, in order to achieve the desired level, you may end up having to use daylight lamps with CTO gel. An added safety note, under no circumstances should you place lamps so that they are pointing into a road, or other traffic flow, even in daylight.

Should your shots include buildings, their internal lighting will almost certainly need to be boosted/augmented (since you've underexposed). Due to the high levels of illumination that may be required, even though you're probably using tungsten, you must take care not to overload local electrical circuits. That being the case, I would advise you to err on the side of caution and always have a generator for DFN shoots. Don't forget that this also entails careful planning for the routing and securing of the associated cable runs. Modern offices and buildings with computer controlled environments are a nightmare in this respect, both from a point of view of added heat from lamps and cable entry, and thus best avoided from appearance in shot if at all possible.

When it comes to exposure decisions, if you have full post production resources available, you can afford not to be too enthusiastic with under-exposure. Don't go for more than two stops, and possibly less, so that you retain all essential pictorial detail. At a later date, you can 'sit' the pictures in post if required, under controlled viewing conditions. The same goes for any alterations you may make to picture processing, leave them till post for consistent results. In the past, I have marginally adjusted the gamma, since I certainly didn't want an increase in highlight handling.

But, having said that, if you do feel it necessary to make gamma adjustments, beware the sky and avoid having any 'daylight' highlights in frame to begin with. With this in mind, I will often use a 0.6 or 0.9 ND grad, probably together with a dark blue grad, which really helps pull down the level of the sky and give a late evening feel to the picture. With grads, I usually find that I need a fairly sharp edge transition, and that a static frame is mandatory. Any attempt at camera movement will almost certainly draw attention to the edge of the grad.

If you're really unfortunate and there's sunlight around, you'll probably have to opt for making it appear to be moonlight, which may mean heavier underexposure, and ferociously bright tungsten light for foreground subjects. It rarely looks convincing though, and I'd pay close attention to the weather forecast. If you have a choice, overcast conditions are preferable, but the worst case scenario is fluctuating conditions, sun, cloud, rain, etc in the space of a couple of hours (or less). The only advice I can offer in these circumstances is to wait for conditions to stabilise, which is not too far from the advice given to me many years ago by other experienced cameramen on the subject, when shooting DFN, wait until it gets dark enough to be truly convincing!

Night light

Whilst blackness can be convincing, that shot of an over-exposed reporter in the middle of an otherwise black frame, might well be from war-torn Iraq, tsunami-hit Indonesia, or down the Guinness mines in Ireland, but it could equally be from a car park in Ilford for all the visual information in frame. Well, as a self respecting cameraman, you're not going to place the reporter in the middle of the frame for a start, so you must also properly balance the foreground lighting to complement

LED lights are dimmable without changing colour temperature
Picture courtesy of www.cirrolite.com

the level of illumination in the background.

Since you're unlikely to be able to adjust or influence the level of background illumination, your exposure will be governed by this level, unlike the PTC/interview example given in Lighting Part 1. For the majority of night exteriors, in order to get the maximum detail from your surroundings, this almost certainly means that you'll be working wide open, probably with added gain. Set this exposure first before adding your foreground illumination.

Again, in these circumstances I suspect that you'll only have one lamp, often the onboard camera lamp. As noted earlier, the modern examples tend to be excessively 'spotty', and so are not conducive to hand held work. The spotty nature of their beam is accentuated by camera movement varying the position of the hot spot over and/or around the foreground subject. However, since your exposure is governed by the background, by the time you switch on your lamp, given the subject/camera distance, you'll almost certainly find that it is far too bright.

There are several ways to reduce the illumination, my favourite being spun. If necessary, this can be doubled or trebled (or more) to give the required level. It is available in varying 'densities', I use the term loosely, as it shouldn't be confused with neutral density, and if it's used outdoors, as previously noted, it won't 'rattle' in the wind, unlike gels. It tends to diffuse the light as well, and so immediately loses the hot spot – definitely my favourite.

Of course you can use ND, and you can use ND together with spun. There might be an occasion when you do not want your light

Lightweight flexible arms – these are from MicroDolly Hollywood

diffused in any way, especially if it alters, or overly illuminates objects/items close to the reporter that you would prefer to remain 'in the dark'. As well as reducing the intensity of the beam using ND, a thoughtfully placed piece of black wrap may solve the problem, or you could use your reflector as a flag, if you can thrust it into somebody's hands nearby.

I have also found that having the camera lamp mounted rigidly on top of the camera is rarely the ideal place for it, unless it is used as a fill light or catch light. I often mount mine on a lightweight flexible arm, which I attach to the camera (clamped to the handle is often the 'handiest' place). I can then move or pan it slightly from one side to the other. The other advantage to having the lamp mounted in this way is that you appear to know what you're doing, and you can more easily persuade your reporter to stay in the position you choose ("Or the viewers won't see you, luv!").

Interview skills

For me, being asked to do an interview solely with the onboard lamp is a compromise too far. The results can only ever look cheap and shoddy, and not show the interviewee, reporter or production in a favourable light (sorry, couldn't resist that). As you can imagine, if the camera is tripod mounted you have to pan from one to another, and the light source moves, or if you're hand held, the distance between camera and subject is forever changing, continually altering the facial exposure. An exterior night-time interview requires the same lighting treatment as discussed in Part 1, the only major difference being that you may need to adjust the level of your foreground/subject lighting to allow background detail to be revealed.

The other major concern is safety, and as per the advice in Part 1, you must never leave lamps on stands unattended or unsecured. In the dark, you must be doubly careful about the safety of cable runs and any other loose equipment, in order to prevent trip hazards and other potential sources of accident or injury. Remember the other important safety point about night shoots: Always carry at least one torch.

Plus, frequently check the status of the batteries, change/charge them regularly.

Another point worth noting from Part 1, should you decide (through dire necessity) to use a torch to illuminate your subject, first look at its beam. You will almost certainly see that it's uneven, and probably casts a noticeable pattern of light from its reflector on the subject. This beam patterning is almost always objectionable, but can be alleviated by using spun over the front, providing you can cope with the lessening of the intensity, and the resultant diffusion of the light/beam path.

Night time desert shoot
Picture courtesy of Zeferino/Arri

Don't be afraid of the dark!

As you'd seek to utilise the type and 'feel' of light already found on an individual location during the day, do the same at night. Modern cameras are sufficiently sensitive to allow the use of most street lighting to provide adequate illumination for the background.

The foreground, on the other hand, is a different kettle of fish, and I would suggest that you never trust any 'found' light on location to provide your main/key illumination, for skin tones at least. Too many street lights are poorly maintained as well as having a poor spectral response, and may also be running on a poorly maintained electrical supply, giving rise to occasional flickering, or worse. But they do provide an ambience, often just right for the background.

However, if you do decide to use them, check with the local council beforehand as to whether they remain on all night!

Moreover, should you be afraid of the dark? Many years ago, those of us working in telly had to religiously ensure that we had a volt on the waveform monitor, or the pictures would be deemed untransmittable! But there are times when you can let your subject move from light to dark and back again, in fact, that's often what happens to people walking along a street at night, patchy illumination. I love it!

I've commandeered the title Prince of Darkness and produced some wonderfully moody and spooky scenes. If you get the chance, go for it, providing it's in a wide-ish shot. That's the caveat, it doesn't work so well in close up, beware the change of mind on shooting at the last minute, and study the script to see whether

expressions are vital. Dialogue may hold up in relative darkness, but expressions don't.

I suspect you all know that for these more considered shoots, visual convention is to make overall moonlight slightly blue, and street or house lights slightly yellow/orange; in relation to your camera's 'white'. I would emphasise the word 'slightly'. Broadcast cameras have an excellent colour matrix, lesser cameras often do not, and may over-emphasise an attempt at subtle colouration. Use a reliable colour monitor if you're going to be 'colour shading' in this way.

Safety last

When shooting at night (or in any particularly dark areas) I must add one final word on safety. Do not turn off any lights on location without giving adequate warning to all those around you. Moreover, it is good working practice to turn off lights individually, rather than plunge an area into complete darkness. Best practice is to ensure that there are always some 'working' lights left on until your location has been completely wrapped, and that the genny is the last piece of equipment to be derigged.

Bibliography

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Alan Bermingham
Focal Press, 2003

Zerb basics are primarily aimed at people working on single camera locations using cameras with 2/3 inch CCDs for broadcast television transmission (or its equivalent technical standard). Cameras whose specifications fall outside what we have come to accept as the broadcasting norm may or may not have all the facilities mentioned in the text, and those facilities also may not be operated or positioned as indicated.

Left and right when referring to cameras, is determined by the cameraman's operating position, and is thus the same as camera left and camera right.

Where reference is made to recording on tape, this has become virtually a generic term used for the recording medium in the camcorder (used when you're 'filming'). Therefore, please insert the term for whatever recording medium your camcorder uses where you see the word 'tape'.

The operational disciplines associated with multi-camera studio or OB productions dictate the presence of many people on set/location who can provide help and advice should difficulties arise. In many instances working practices in these environments differ from those on single camera shoots.

Some technical details may have been simplified to make understanding easier, and are thus illustrative rather than striving to reflect precise operational design or mathematical accuracy.

Whilst every effort is made to ensure the accuracy of the information, we cannot be responsible for errors, omissions or corruption arising from the electronic transmission of the data.

Members carnet service

Back in April 2005, the Guild launched a new carnet service for members. Around 40 members have already made use of the service and we wanted to remind you all again of this money saver, especially if you are planning a trip.

This is a fast and efficient service. If you go to the Chamber in person, you could have a carnet within three hours. Alternatively, everything can all be arranged electronically from anywhere in the UK within approximately 48 hours.

The scheme is arranged through the Birmingham Chamber of Commerce. You should contact: Sukie Duhaney, Export Documentation Department, on 0121 454 6171, fax: 0121 455 8670, Birmingham Chamber of Commerce and Industry, 75 Harborne Road, Edgbaston, Birmingham B15 3DH.

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Normally, the service costs £251 + VAT, but GTC members will be charged just £150 + VAT.

To receive the discount, you must be an individual, fully paid up UK member of the Guild and quote your membership number.

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Awards Weekend

The GTC council is organising the next award and social weekend to be held in October 2007.

You can nominate cameramen now for outstanding craft skills or manufacturers for equipment that you feel merits a GTC seal of approval. Submit nominations online at *http://tinyurl.com/9bhnn*.

We also would like to invite overseas members to submit their own material, if they believe it is worthy of an award, for the International Members Showcase. The Guild hopes to encourage more members to be a part of the awards, so start nominating now.

Discounts for members

Many of the Guild's sponsors and other equipment retailers will offer GTC members a discount if you mention you are a member when purchasing from them. Many thanks to all those manufacturers and retailers who have already offered this benefit. If you find a company offering discounts to GTC members that we have missed, or you would like your company to be included in our list, contact Alison Chapman on *alichap@mac.com*

Arri 20% off list price	Martin Carnell/Siobhan Daly +44 (0)1895 457034/457000 mcarnell@arri-gb.com and sdaly@arri-gb.com *www.arri.com*
Brick House Video 10% off all products	Paul Hiorns +44 (0)23 8067 6026 *www.brickhousevideo.com*
Film & TV Services, Park Royal, London Lighting consumables – bulbs, gels, safety equipment; deals on generators and electricians etc. Small and large purchases welcome	+ 44 (0)20 8961 0090 *www.ftvs.co.uk*
Hamlet Discounts on test signal generators	Stephen Rutherford +44 (0)1494 793763 *www.hamlet.co.uk*
Miller Tripods Europe 25% off list price plus The Miller Three Year Extended Warranty	+44 (0)1243 555255 sales@millertripods-europe.com *www.Millertripods.com*
MVS Video 5% discount off new equipment 10% discount off used equipment	Paul Marshall +44 (0)1303 891468 *www.mvsvideo.co.uk*
Pangaea Production and Facilities Discounts on full digital production and Avid post	Karl Lear +44 (0)1392 879874 *www.pangprod.com*
Procam Discounts on hire of broadcast gear	Malcolm Jeffries +44 (0)20 8433 8199 *www.procamtv.com*
Pyser-SGI Discounts on Microtest Pluge Generator and Contrast Meter	Paul Goodwin +44 (0)1732 864111 *www.pyser-sgi.com*
Shooting Partners Ltd, Hampton, Middlesex 15% off hire equipment prices	Darrin Dart +44 (0)20 8941 1000 *www.shooting-partners.co.uk*