ENG INF

Winter 1987/8 No. 31

Queen's Award presented

At a recent ceremony at Kingswood Warren the Director of Engineering, Bill Dennay, received the Queen's Award to Industry for Technological Achievement on behalf of Engineering Division from Her Majesty's Lord-Lieutenant of the County of Surrey, Richard E. Thornton OBE, J.P. He was accompanied by Director General, Michael Checkland, Deputy Director of Engineering, Charles Sandbank and the Head of Research Department, Dr Bruce Moffat.

BBC to give annual IEE Faraday Lectures

BBC Engineering has been invited by the Institute of Electrical Engineers to present the annual Faraday Lectures. The Lectures, which are aimed at 16-18 year olds, visit seventeen different locations in the UK and Ireland, in the period from September 1988 to March 1989.

John Brooks, who has just retired as Assistant Head of Engineering Training Department, has been appointed Project Leader, and Alan Lafferty (EID) has been nominated as Tour Manager.

SMPTE Award

Michael Stickler, Deputy Head of P & ID Tel has been elected a Fellow of the Society of Motion Picture and Television Engineers (SMPTE) in recognition of his work with remote control and digital video interface standards. For the last few years Mike has been Chairman of the European Broadcasting Union (EBU) Committees which, in close collaboration with the SMPTE, have investigated and agreed the international standards for the remote control and digital video interface of television production equipment. These have resulted in the agreements contained in EBU Technical Documents 3245 for remote control systems and 3246/7 for the parallel and serial interfaces.

Michael, who has been an engineer in the BBC since 1953, received the Fellowship from M. Carlos Kennedy, President of the SMPTE during the Society's recent 129th Technical Conference in Los Angeles.

New graphics area for Cardiff

"Children in Need", on Friday 27 November, gave BBC Wales a golden opportunity to try out their new £280,000 electronic graphics area for the first time in earnest. And, according to Senior Graphic Designer (Wales), Clive Gould:

"The operation worked most successfully. Various graphic images were created using Paintbox and these, along with Slidefile, were made available as sources to the gallery in Studio C1. One of the most important contributions from the Graphics Area was provided by Carl Blundell who wrote computer programmes for eight separate animations, displaying totals. He also devised a graphic display of up-to-the-minute totals, changing in- vision. The new Graphics Area - baptism of fire, going into a live transmission - proved to be most successful". BBC Wales currently produces around nine hours of television programmes each week for BBC 1 and BBC 2 in Wales, plus a further ten hours per week of Welsh language programmes for S4C. There is also a commitment to provide about sixty-nine hours of programmes per year to the two national BBC networks, in addition to special programmes such as "Children in Need", General Elections, etc.

The graphics department at Broadcasting House, Llandaff, is split into four groups:

- News, Current Affairs and Sport
- Presentation
- General Programmes
- Childrens Programmes

To service these groups, Clive has the following staff working to him: five Graphic Designers; six Graphic Design Assistants; seven Graphic Assistants; one Photographic Technician; one Illustrator; one Graphics Clerk and, of course, the aforementioned Carl Blundell who is the Computer Graphics Programmer/Designer.

The Graphics Area is located on the first floor of Broadcasting House, at the north-west end of the building, above studio C2. Previously, the area relied on "cardboard engineering" techniques to produce graphics, augmented by two Acorn Cambridge Workstations driving Prisma 2 and Prisma 3 frame buffers, to provide "real time" graphics, captions etc.

After about seven months of re-furbishment, the up-dated Graphics Area now contains a Quantel Paintbox, a Sony CCD Colour Camera (DXC3000), an Aston 3B Character Generator and the BBC Slidefile/Artfile system manufactured by Rank Cintel Ltd. There is also a new character generator area in a separate room, adjacent to the main area. The Acorn workstations from the previous set-up have been retained and are now tied in with the new Graphics Area.

The project was constructed by P&ID Tel. under the supervision of Bob Head. Working with him were Technicians, John MacDonald and Andy Belcher, along with Wiremen, Alan Choe and Graham Jardine. The following technical description of the new Graphics

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Licence Agreement

A manufacturing licence for the **Dynamic Carrier Control Limiting Amplifier, AM6/30,** has been agreed with Marconi Communication Systems Ltd of Chelmsford. This unit allows the level of the transmitter output to be actively adjusted according to the programme content, whilst maintaining the modulation index. Because virtually all a.m. receivers include an a.g.c. circuit, this technique, known correctly as AM Companding, is unlikely to result in a perceptible degradation of the receive signal quality. The system was described in greater detail in the IBC '86 issue of Eng. Inf., (Number 26.)

Transmitter News

The following transmitters have opened or changed since October:

UHF Television	
Barrow -in-Furness	Cumbria
Cowling	N. Yorks
Hastings	E. Sussex
Hereford	Hereford
Lumphanan	Grampian
The Bournes	Surrey
Voe	Shetland
VHF Radio	
Crystal Palace	R1 (Temp)
High Wycombe	Bucks

Note: The R4 low-frequency transmitters at Droitwich, Burghead and Westerglen will change to 198kHz on 1st February 1988.

Newcastle move to new Broadcasting Centre

By Nick Sharwood-Smith

If the world of Broadcasting seems to be a changing place today, in terms of programmes and technical innovation it always has been. But in terms of resources and administration policy, there have been remarkable changes since the previous article in Eng. Inf. on the construction of the new Broadcasting Centre in Newcastle. Housing both regional TV and Local Radio staff, and occupying a green field site, the building offered the opportunity to create a centre for programme making which would set the working environment for well into the next decade and beyond. The BBC's production needs have altered since the project was first conceived and a certain amount of re-thinking has become necessary as the work progressed. The work has not been all in the hands of P&ID Tel, with contracts for installation and equipment supply going to Marconi (studio vision systems), Calrec (sound desks) and Philip Drake (talkback and intercom systems).

Newcastle Broadcasting Centre

Links with Carlisle have become less important now that the Centre has been joined by Leeds and five Local Radio stations to form the new North East region. Regional ties have been strengthened by moving TV and Radio together from their previously separate, cramped accommodation. Joint Newsrooms, with shared intake facilities, have been designed to cater for regional and local output as well as network TV and Radio. The demise of the Link 130 cameras has meant that the new TV studios have been held up, awaiting delivery of substitute Ikegami cameras and control units, and the old studios have had to support regional programming for longer than anticipated.

Radio Newcastle moved into the building first and were soon able to offer network radio a regular facility by supporting a monthly edition of Woman's Hour. TV were not far behind with, Administration staff and then, when delivery of the five Ikegami cameras took place, operational training at the end of September. A variety of work for children's programmes began with recordings of Jackanory, quizzes and a location drama; the latter utilises the station's Renault Espace van equipped for use as a PSC unit while quizzes use the audience facility in Studio A.

STUDIO A

Studio A is the larger of the two TV Studios, occupying some 240 sq metres and the full two storey height of the main part of the building. Having no observation windows to the control gallery, best use has been made of the available floorspace, with no restrictions on the position of the cyclorama. Equipped with three full-facility Ikegami 323K cameras, and able to handle up to five cameras using Triaxial cable, the studio is designed for drama, light entertainment and audience participation programmes. A tiered seating system can be brought into the studio on "hover trollies" - floating a fraction of an inch off the ground - and assembled in three sections to seat 116 people.

The studio's two longer walls accommodate four wallboxes carrying vision and sound circuits, including talkback and programme feeds, to and from the external technical areas. Adjacent to each is a camera connection box and a variety of switched and unswitched mains outlets. Audio and video tie-lines have been extended from the wallboxes to the TV and Local Radio apparatus rooms. Fifty-six low level microphone circuits go to the sound control room and twenty-eight to the Local Radio, Studio 2 cubicle. Provision has thus been made to use this large acoustically treated area for more ambitious productions in Radio as well as in Television; Radio Newcastle have already used it for recording a Brass Band programme.

Above the studio floor is a twelve track lighting grid, with five motorised pantographs on each track. The sixty

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motorised sources are complemented by lamps on a fixed peripheral track, and a number of short overhead lighting bars. These are designed to move transversally between unextended motorised luminaires and can accommodate extra light sources to fulfill the most specific lighting requirements. A dual-source "Giano" luminaire is suspended from each of the motorised pantographs. A sophisticated remote control enables the lighting director to use a "wireless" hand-held keypad to move lights and identify them from the vantage point of the studio floor, thus, allowing shorter setting-up times.
Twenty-four "Iris 2" soft-source luminaires are peripherally mounted on manual pantographs for general cyclorama illumination and these can be augmented by twenty-four Orion 4 groundrow fills at the base of the cyc. The peripheral fixed-track has space for a further twelve "Pollux" spotlights evenly distributed round the studio. Control of the lighting is from the desk in the Production Gallery which seats the Director, T.M., Vision Operator and Production Assistant, in line opposite the monitor stack. The sound staff occupy a cubicle situated behind the main desk, acoustically separated from the main area but with an observation window to facilitate visual communication.

A Cox T16-1 Mixer forms the heart of the vision system, having a single effects bank, downstream keyer and some ninety-nine wipe patterns. The downstream keyer has variable edging and colour fill, and the CSO effects are augmented by two BBC soft-edge split-screen switches (MX5M/504). The latter appear as inputs to the desk together with: six outside sources (locally selectable from a twenty-four input Probel Matrix); five cameras; a Slidefile stills-store and an Aston 3 character generator. A local selector can be used to route any one of eight sources to the key inputs of these switches, and any one of sixteen sources to each of the foreground and background inputs. A Questech Charisma digital video effects unit is likely to be added for use both in Studio A and elsewhere on station.

Control of the studio lighting is from a Rank Strand "Gemini" board. This supervises the working of one hundred and twenty 5kW dimmers in the switching room, via a memory system with instant recall using the Gemini's control keypad. A disc-drive allows individual effects or sequences to be stored for later use. Any of the studio's dimmers can be allocated, singly or jointly, to any of the channels on the control board. A colour VDU dedicated to the Gemini gives a constant read-out indicating channel and group status. A desk top mimic, using incandescent lights fed from the output of the individual dimmers, shows the relative output voltage of the feeds in their correct geographical location in the studio. As well as complex fades and mixes, the control system includes a programme effects generator for producing "Disco" lighting.

In the Sound Control room is a 28-channel, 4-group stereo Calrec desk. Each channel has multi-band equalisation, with four auxiliary outputs for foldback, as well as dual echo sends and a separate PA output. There is also a simple eight-channel submixer on the upper part of the desk, designated the "audience mixer", allowing live studio effects to be derived without using up valuable space on the fully equipped section. Dynamic control is provided by the insertion of any of six compressor/limiters into the channel, group or main outputs, using the desk mounted insert jackfield.

STUDIO B

Studio B is a small studio of approximately 30 sq metres, without the headroom of Studio A, equipped with two lighweight Ikegami 323P cameras. Although designed for "self-op" use with a mobile Presentation Desk, the full facilities of the control gallery can be used to allow more exacting live programmes to be broadcast. Post production work is also envisaged here and a window has been provided to allow visual communication between the studio and the gallery, where sound control and vision control occupy the same room.

A single wallbox in the studio carries video and audio tie lines, together with ten low level microphone circuits, to the gallery. A basic lighting grid, composed of sliding and fixed bars, offers suspension for the luminaires. These can be connected to any of the twenty outlets round the ceiling, two of which are fed from each of the studio's ten 5kW dimmers. Control of the dimmers is by quadrant faders (plus a master), with a special circuit which allows the Presenter to operate "production lights ON and

houselights OFF" at the press of a single button.

The masterswitch is on the Calrec Presentation Desk which, together with two trolley-mounted monitor stacks and a caption desk, form a semi-permanent fixture in the studio. It is a standard unit with a set of ergonomically designed controls, giving it the superficial appearance of being manufactured by Fisher-Price! It is intended to be used with a locked-off camera and minimal engineering assistance to produce opts into BBC1 or BBC2 for Breakfast Time and regional News bulletins. The adjacent caption desk allows local control of the Aston caption generator and associated overlay effects unit, via a remote keyboard connector and Probel selection matrix.

SYPHER and RECORDING FACILITIES

In addition to acting as gallery for live broadcasting in Studio B, the control area is equipped to be used for post-production work, specifically as a Sypher suite for re-recording and enhancing vt sound. Mounted in the bays behind the Calrec 12-channel, 8-group sound desk is a Sony Hi-Band U-Matic videotape machine, which can be linked by tie lines to any of the vt areas. An Audio Kinetics Q-Lock synchroniser is being used to link the Sony with Otari MC70 eight-track and Studer twin-track audio tape machines using recorded timecode information. A completed mix, compiled using tape, cart, disc or speech originating in the studio, will then be recorded back onto the master vt machine.

The Calrec desk is equipped with bargraph metering on all eight groups. A master mic/line switch allows easy interface with the Otari, whether in recording or mixdown mode. The tape machine remote control box and the control keypad for the Q-Lock synchroniser are both situated on umbilicals to the right hand side of the desk and Dolby A has been provided for the eight track. Two digital reverb devices have been provided - a Lexicon PCM 60, which offers a selection of reverberation times with "plate" or "room" characteristics, and an AMS delay line, capable of being user-programmed for more variable effects.

There are on-line vt facilities for both 1" and 3/4" formats, with another three rooms designated as off-line PSC Editing Cubicles; two of these sandwich an acoustically treated voice booth. Each of the off-line rooms contains a pair of Sony U-Matic video-tape machines and a four-channel audio-mixer, linked to allow basic editing and audio dubbing.

The PSC on-line cubicles are designated VT1 and VT2 and, like the off-line areas, contain a pair of Sony U-Matic machines and a four channel audio mixer. They are also equipped with the necessary switching and communications facilities to enable them to replay tapes for transmission. A Master Mode switch has been installed in order to set the whole cubicle into either Transmit or Edit mode. A single button activates a multi-level switch which will configure the cubicle for the least possible picture degradation in Edit mode and the maximum fail-safe provision in Transmission mode. The facilities for 1" editing and transmission are provided by two pairs of Sony C-Format machines in Cubicles VT3 and VT4. These areas are equipped with similar communications, record and replay capabilities to those in VTs 1 & 2. Should three-machine editing be needed, then the Edit Control room, VT5, can be used. The equipment in this area is capable of much more complex editing, using a Cox T8 vision mixer, to take inputs from either of the PSC On-line cubicles, or from the 1" cubicles, and record onto either of the 1" machines VT3B or VT4B. Other inputs to the mixer are from the Slidefile stills-store, a local VT clock, and an Aston caption generator. The recording process can be done manually, or under the supervision of a Sony BVE900 edit controller working with the vt timecode information. To aid this interface, the T8 mixer has a Memory Control Effects (MCE) facility which enables up to 64 complete configurations of control panel settings to be stored and recalled.

GRAPHICS FACILITIES

In the same corridor as the PSC Edit cubicles is the Graphics Area. Here, the desk contains the controls for the Rank Cintel/BBC Slidefile, the Aston 3 caption generator and the tablet for the Slidefile's additional processor - Artfile. The Slidefile/Artfile system has inputs from: a local tk machine or BA 10 (for capturing stills) caption scanner; the Aston; a camera in each studio and an RGB decoded feed from a 24-way Probel selector . A Sony CCD rostrum camera is also available, adjacent to the tk

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NEWCASTLE
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Newcastle Studio A gallery

machine. Control of this equipment can be remoted to various parts of the building from the Graphics desk. When local control is kept for live broadcasting, there are comprehensive talkback and intercom facilities for communicating with the studios and other technical areas. Artfile is the primary source of graphics origination in the studio centre and a second Slidefile processor is available in the Design Office, to allow work on longer projects without interruption to on-air commitments.

TECHNICAL APPARATUS ROOM

At the centre of the building is the Technical Apparatus Room (TAR). Here, some fifty bays deal with control, monitoring, routeing and line-up of the station's circuits. The technical monitoring position, where sound and vision can be assessed, features a comprehensive range of internal and external communications facilities. There is also a camera line-up position and a bay where the fifteen camera points round the building can be cross plugged to the relevant camera control unit.

LOCAL RADIO

The Radio Newcastle facilities are centred on a small Studio 1, adjoined by two Presenter-operated cubicles which contain BBC Mk 3 stereo desks. In addition the News team have a small L-shaped studio and there is a 45sq m Studio 2. The cubicle here is equipped with two sound desks - a BBC Mk 3 and a 24-channel, 8-group Chilton, designed for coping with quiz shows, audience shows, groups of musicians and the compilation of other more complex programmes. Should the studio fail to provide sufficient space, other possibilities are available: the Reception area has been pressed into service as a venue and the lines through to TV Studio A include a CCTV link for monitoring Radio recordings.

The Newcastle Broadcasting centre that has emerged after years of planning and much engineering endeavour, is shaping up as a responsive and versatile production tool.

Southampton Alight

Southampton has the BBC's only five sided TV studio, and it has severe limitations in space, lighting, power availability, and ventilation.

The recent design brief to introduce a new set, calling for bottom lighting of the cyclorama, looked impossible to meet on all three counts: even if there was the power, there is no room for the conventional Palace Island.

An uncoventional answer was suggested by P & ID Tel. - use fluorescent tubes, close to the bottom of the cyclorama cloth.

This would release floor space, and the increased efficiency of tubes over tungsten lighting would reduce the power and ventilation requirement to manageable proportions. A tube with a suitable modern phosphor should have a bright light output and larger persistence.

Engineering staff at Southampton took up the challenge and discovered that high efficiency tubes did have a long persistence and flicker is not a problem. The real problem was designing a reflector which gave the correct gradation of light up the cyclorama cloth.

The final design involves banks of four tubes and a reflector which is an unlikely hexagonal shape. The light unit can literally touch the cyclorama cloth and have a coving immediately behind it - only 18 inches out from the cloth.

Process Shots in Post Production

or How To Get Rid of Corrugated Iron And Concrete in Period Drama

WHAT ARE PROCESS SHOTS?

Process shots, sometimes referred to as matte shots, are a means of building up a final picture in post production from an original scene. This would generally be the process of adding an authentic background to a scene after shooting is completed. Whilst the idea is not new, modern technology has provided the means to develop and adapt, so bringing the opportunity for greater visual expression over a broader television base. The technique described here is that developed at Pebble Mill for use in Period Drama, although its versatility has enabled diversification into other production styles.

The original method for producing scenic backgrounds beyond conventionally constructed scenery , was the Glass Shot. Used by the film industry long before the days of television, it involved the setting up between camera and action, a large sheet of glass. On the glass the scenic artist prepared with paint and brush, all the scenery required. This highly skilled operation is still in use today, but is expensive in time. The camera, when its position has been decided, must be locked-off and remain undisturbed for the time it takes the artist to complete his or her work and for the scene to be shot. Any movement of camera or glass would destroy the precise register between real and make-believe. The artist works to the camera's picture, either viewfinder or picture monitor, seeing the final composite as it is built up.

Advances in video technology have made possible an electronic development of the glass shot called the Process Shot. The expensive time once spent on location is now eliminated by use of the Electronic Frame Store. The ability to freeze frame and maintain picture quality and register, allows the scene to be shot as normal, then, on return to base, play back the tape and "grab" a still from it. The artist now works to this still to prepare the background.

THIS IS HOW IT WORKS

1. The original scene is shot with a locked-off camera so that the background to be added remains in register. The camera now, of course, only has to be locked-off for the actual time it takes to shoot the scene.

2. During editing, a still-frame from the scene is grabbed into the electronic stills store. All the shots to be processed are thus stored and then transferred to data cassette.

3. The scenic artist views these stills and, with the Scenic Designer, decides what will fill the spaces at present occupied by modern factories, lighting grids and so on. He takes a tracing of the scene from the monitor, and from this paints the complete scene in the peace and quite of his own studio.

4. To put the artwork into the original scene, the original still is recalled from the frame store, and the painted background is placed beneath a rostrum camera. The two images, still and camera, are keyed together by a matte signal produced by a monochrome inlay camera. The matte is worked in black paint on a light box onto which the inlay camera looks. The monochrome signal causes an electronic switch to key the two parts of the scene together to make the composite . The scenic artist produces the matte using a monitor to see the composite develop from the action still and the artwork beneath the rostrum camera. The transition between the two being carefully placed to be outside action and well concealed by features in the scene. When complete the composite is retained in the frame store.

5. When all is completed, the frame store holds the original grabbed frames plus the new composites. Putting back the action involves video tape once more. Bearing in mind that the composite stills have all the requirements of the final scene less the action, it is a straightfoward matter to play in the original tape and insert the new background around the action. Once more the electronic switch is used, now with a keying signal derived electronically of suitable shape for this purpose.

The facilities required for this system are no more than those available for normal programme use. They are shown overleaf.

Process Shots
Continued from previous page

i ELECTRONIC FRAME STORE
This is a Rank Cintel Slide File and can hold up to eighty four stills in store and fifty or so on data cassette. There is no degradation of image as the system is digital.

ii ROSTRUM CAMERA
A broadcast Ikegami HL79D, or Sony CCD, camera is mounted vertically on a custom-built stand. The stand positions the camera over the artwork. The camera's zoom lens is used for most applications to achieve precise sizing of the image; a prime lens may be chosen if quality is paramount. The rostrum is set up in the standard monitoring and control system of the studio control room. Under such conditions there is full camera control of lift, exposure and colour. Using these parameters, with artwork backlighting from the lightbox balanced with frontal lighting, complete control is available to achieve the exact image required.

iii INLAY CAMERA
A small monochrome camera, similarly mounted to the rostrum camera, is used to produce the matte or keying signal that operates the electronic switch which cuts, or inlays, the artwork from the rostrum camera into the still of the original scene. This camera also looks down onto a lightbox on which the artist builds up the matte in paint and black tape.

iv ELECTRONIC SWITCH
This is provided by the standard studio Grass Valley vision mixer with upstream quad overlay providing an additional three levels of effects. The signals from the rostrum camera and scene reference still are normally fed to the third level of overlay (levels in cascade). The key is routed via a low-pass filter to reduce noise from the inlay camera thus providing clean keying with a slightly softer edge. The remaining levels allow mixing in of colour tints, or shading by means of the Grass Valley pattern wipes.

Scenic Designer, Scenic Artist and Vision Control work closely together from the planning stages right through to post production. Their respective fields of operation are put together to achieve as fine a result as possible. The process of producing the spectacular opening scene or that little extra lift to a rather down-beat two-shot, is available at a realistic budget. The cost of maintaining team and artists on location for such work is now no longer necessary. Of particular advantage to period drama is the ability to remove non-period scenery and to produce precise authenticity. The background to be added must be decided at the taking stage so that proper adjustments can be made to it. If, for example, a scene contains a tree in leaf as a dominant feature, and the season is required to be altered to winter and the tree to be leafless, then it is quite likely that the visual balance of the picture will also be altered. This has to be recognised at the taking stage so that any adjustments can be made.

Using available equipment is cost effective. By using facilities during "down time" means better utilisation of capital equipment. Video-tape time, always in high demand, is also kept to a minimum.

This shot was taken on location in Whitby, but was required to look like a London wharf in the 1830's. See page 9 for the end result.

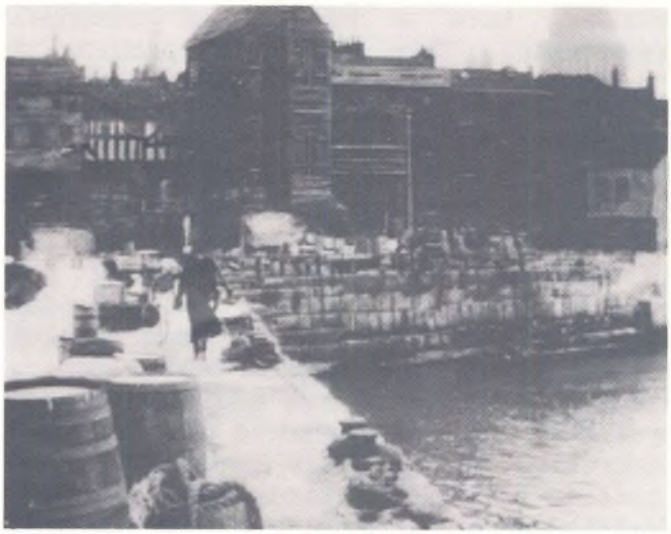
Productions that have used process shots inclued "Oliver Twist" in 1985 which used eighteen process shots to provide period backgrounds on location. The "Golden Oldies Show" built a complete three minute song sequence around process shots to create a surrealistic backdrop. Eleven authentic period backgrounds were produced for "David Copperfield in 1986. Here use was also made of 35mm colour slides to add cloud effects by electronically superimposing them over artwork. The use of slide material can be invaluable as it can release the artist from the time consuming work of producing cloud and sky.

Process shots are ever developing. The basic system as described is very flexible and, as experience grows, so the system is pushed and stretched to encompass new visual requirements. As the facilities are in constant programme use, and as such, have to be booked, work for process shots often takes place outside normal programme hours. In this way it lends itself to being slotted into scheduling relatively easily. There are a number of technical features that have become apparent as a result of this work. As the time required by artists actually working with the rostrum camera can extend over many hours, stability is one item to be considered, particularly with the inlay camera. The old design does not exhibit the standards one would like for this purpose resulting in "creeping matte" frustrating the precision of the scenic artist. Here, a micro with suitable software would be an advantage. The CCD camera produces a more consistant image across the frame than the HL79D which has increasing registration errors towards the corners. It is not unknown for the artist to paint them out, but drift of registration is a nuisance. An improvement in picture keying could be achieved by introducing an RGB keyer so avoiding the Slide File coder/decoder where inevitable degradation takes place. But such a move would eliminate the flexibility of the quad overlay.

In addition to the processes involving painted artwork, use is also made of electronic effects. Electronic painting with Quantel Paint Box is one technique available for certain work. But supplementary effects that work with conventional paint are very common. Shading and colouring can be carried out extremely easily; for instance to control areas of highlight, and to match colours accurately, not only from shot to shot but across the frame. The television version of darkroom dodging and shading!

Modifying the system for new visual effects or experiments is an ongoing situation. Indeed, the moving process shot is now being investigated and a forthcoming drama production from Pebble Mill may utilise such an effect.

The contribution of engineering to this system goes well beyond the accepted bounds of conventional engineering requirements. It was introduced at Pebble Mill by operational engineering who saw how the new technology could be further utilized. There is an ever-increasing demand for engineers to understand the visual requirements of programme makers, and the long established experience of those engineers employed in areas such as Vision Control and Video Tape, is enabling this demand to be met.



By means of a process shot Whitby is made to look like a London wharf in the 1830's

The understanding of what makes a picture work in a visual sense is essential, for it is only at this level that one can talk on equal terms and gain the confidence of those who produce and design programmes. The ability to translate a shape or dramatic effect into "engineer speak" of volts, microseconds and vice versa is the all important message. It is one of the jobs of the Vision Control and Maintenance Supervisor to set up and operate the Process Shot system. He works closely with the artists constantly adjusting the cameras, lights, filters (both optical and electronic), and the vision mixing system to achieve the required results. He has the responsibility of ultimate technical quality, and in making his judgement in this respect, he takes into account not only sound engineering practice but the needs of the programme for which he works.

This is one more area where engineering is making available to television the means to further advance itself as a visual medium by allowing greater scenic inventiveness and realism to a degree not previously possible.

Peter Hodges
Vision Control and Maintenance Supervisor,
Pebble Mill

CARDIFF

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Area was supplied by Bob Head:

Inputs to the Graphics Area can be selected from studios, vt etc, on two incoming lines, or locally sourced from the Sony CCD Camera, as appropriate. A Comb Filter Decoder (Rank Cintel) is to be provided shortly: pictures stored off-line by the Slidefile, using this type of decoder, have a minimum of residual subcarrier. This avoids the problem of "throbbing colours" when pictures are re-coded, due to mixing of subcarrier components.

The area has a central RGBS matrix (16 inputs by 8 outputs) for routeing signals, in component form, in and out of the painting systems. In addition, a coded matrix (again 16 X 8) allows comprehensive monitoring of all sources and outgoing lines. The two matrices are manufactured by Abekas Cox, integrated in one unit, and controlled by an 8-bit processor which utilises the SMPTE control protocol, with distributed processors in the control panel modules. This system allows additional control panels to be added

The Paintbox area in Cardiff

easily, while another system has been developed which allows automatic pulse-chain change-over when the Aston 3B character generator is used directly with Cardiff Studio C1 .

An RGB linear keying module (Probel) is provided in the area and this contains a key matrix (6 X 1) which selects key signals from either the character generator or a key source unit, developed specially for Cardiff and based around a Cox 220 effects mixer. This permits mixing, wiping, etc, to be accomplished using the linear keying module as an RGB mixer.

Clive Gould, Senior Graphics Designer uses Artfile

Outgoing RGBS destinations from the matrix are fed to a total of three coders, two dedicated to outgoing lines feeding the local router (which can be routed to any area) and the other coded for the monitoring requirements locally. Two pulse chains are provided, mainly to permit the character generator(s) used in the area to be routed into a studio which may well be running on a different pulse chain. Philips LDK 4210 generators locked to incoming black-and-burst provide these pulses via BBC pulse distribution equipment, and relay routeing.

Full communications and monitoring are provided in the Graphics Area with an integrated system, designed by P&ID but manufactured by an outside company. Additionally, the area is linked into the station's Philips M100 system.

Japanese Competition

The Institute of Television Engineers of Japan (ITE), is widely recognized as the most active organization covering broadcasting, television, and the image technologies in Japan. In commemoration of the 35th year of television broadcasting in Japan, the ITE is calling for short papers on the theme "Toward the 21st Century's Television" from young engineers in all parts of the world.

Applicant authors are limited to engineers and researchers under 40 years of age, deadline for submissions is 1st March 88. ITE Grand Prize US$ 3,000. Prize for outstanding papers: US$ 1,000. More details from HEID LBH 5437, Room 714 HWH.

Helicopter used to measure aerial patterns

External Services did something unique last October in the BBC when they measured the actual radiation pattern of HF aerials at Rampisham transmitting station. In the history of HF broadcasting, the aerial patterns were always determined theoretically and this calculation was then combined with the height of the ionospheric reflection to give the service area for a particular aerial.

When the Rampisham aerials were designed a computer program was used to determine which aerial type to use to give a particular radiation pattern. The program assumed an ideal aerial above flat ground of regular conductivity. The height of the aerial above ground was then raised or lowered to allow for the slope of the ground in the direction of radiation. As Rampisham has many undulations nearby, this was an inexact method of prediction but the only one available.

Most major broadcasters in Europe measure the actual radiation pattern, but in the past the BBC has not. In 1982 Noel Sudbury of TCPD saw a demonstration of measurements using a helicopter owned by Swedtel, the Swedish Telecommunication Administration. They were surveying the Norwegian broadcasting station on the island of Kvitsoey. He suggested that the BBC should measure their new wideband aerials. The development of the Rampisham station was completed this year with eight new 500kW transmitters and thirty-four wideband aerials, and a contract was placed with Swedtel by TED to measure radiation patterns.

Discussions took place between Dick Manton, of TED, and External Services, to decide which fifty patterns out of the many combinations on the site would be measured. First, the pattern of standard aerials above relatively flat ground was measured. This was followed by some of the more unusual aerials and others with sloping or undulating ground in front of them. Two aerials in the same bay were investigated, and the effect of obstructing one aerial with another. The gain of the wideband aerials and the performance of different densities of wires in reflecting screens could be accurately measured for the first time.

To avoid disturbances from the helicopter body, a ferrite-rod receiving aerial was mounted on a telescopic pole and lowered to 3 metres below the helicopter once it was airborne. Both the horizontal and vertical radiation patterns were measured in the main beam of the aerial. Transmitters could be used up to full power, with or without programme, but generally 300kW was used for the test. The position of the helicopter was tracked using a SAAB optotheodolite (TV tracker) and a Motorola Mini Ranger III. This is essentially a guided missile control system which updates the distance out from the aerial on 0.01 degrees and the angle of elevation to +/- 3m up to 20km, twice a second. This was displayed for the pilot who flew round the aerial at a distance of 2.5km as accurately as possible, no mean feat in the weather conditions in Dorset in October.The optotheodolite was mounted on the roof of the transmitter building. Cables fed the signal to the navigation equipment in a specially equipped van. This comprised a tv tracker, microcomputer, distance measuring equipment and communications equipment. The helicopter was tracked automatically unless it was obscured by a tower or a cloud, when the operator took over the tracking. The position data was converted by means of the pre-programmed offset values into an actual position relative to the aerial being tested.

The helicopter used was a Hughes 500D. It was a four seater with one of the rear seats replaced by the computer and receiver. The other three seats were for the pilot, the Swedtel engineer, and various BBC joyriders. The chance to view the station from a different angle was not to be missed. It landed on the site for refuelling and stayed on site overnight. Fortunately on the night of the hurricane it was hangered at a nearby airfield, otherwise the tests would have been prematurely curtailed. An accident at Gothenburg had nearly jeopardized the whole operation when a lorry backed into the helicopter on the docks and damaged the tailfit. However as a spare part was readily available it did not delay the tests.

Transmission Planning Unit in Bush House had freed a transmitter from service for the duration of the tests, and had allocated a wide range of test frequencies. The site tests were

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HELICOPTER MEASURES AERIALS
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The Swedtel Helicopter used for aerial measurements at Rampisham and Wenvoe.

coordinated by Graham Powell, the TCPD aerial engineer, who liaised with Brian Ward of the station staff. The operation was complex involving many frequency and aerial changes per day. It went very smoothly, when the weather permitted, and was a lesson in inter-departmental co-operation. Everyone involved was pleased with the outcome.

The amount of data gathered was substantial, running to a hundred pages and will take months to fully analyse. In advance of this, a preliminary study of the results has identified some unusual aerial patterns, and Bush House have requested some reception reports to confirm these findings. Some pretest reception checks had been done in North America to compare three of Rampisham's aerials. A Research Department team led by Andrew Lyner carried out a series of measurements to determine whether or not it would be necessary to use a helicopter to determine radiation patterns in future.

The horizonatal radiation patterns were measured by using a vehicle carrying a loop aerial, on a 10m high extendable mast, around the roads near the site. Further tests concerned the measurement of currents in the ground which contribute to the vertical radiation pattern of the aerial. These measurements will be used to check the validity of a computer program which is designed to predict the currents, and hence the radiation pattern. Results will be compared with the helicopter measurements. The Rampisham results have been used, along with traditional methods, to design a more effective layout of the proposed redevelopment at Skelton.

News of the forthcoming tests rapidly spread through the BBC grapevine and reached the ears of the aerial engineers in TED. They believed that the recently installed UHF television aerial at Wenvoe was not radiating in the manner predicted by their theoretical calculations and that the VHF aerial may be producing out-of-band signals. They decided to take the opportunity of using the helicopter while it was here.

They had two objectives to their tests, firstly to measure the vertical and horizontal radiation patterns of both aerials, and secondly to measure the radiation of out-of-band products which might be generated by the VHF transmitters. This will be more relevant now with the extension of Band II to 108MHz, adjacent to the Aeronautical Band. Although the radiation pattern of the in-band transmitted signals could be calculated from theory, the radiation pattern of out- of-band signals is not easy to predict.

To measure the out-of-band radiation, a signal generator with an output of about half a Watt was substituted for one of the Radio 4 VHF 20 kW transmitters and tuned to an aircraft band frequency. The radiation pattern of the out-of-band frequency was then measured without the listeners to Radio 4 noticing. For these measurements the on-board computer was used in a different mode. Several frequencies were rapidly scanned,and the measured signal was recorded automatically along with the navigational data as before. This knowledge of the aerial and transmitter performance will be used to make sure that broadcasters do not interfere with aircraft navigation systems.

In two days, comprehensive measurements were carried out on: the network VHF aerial (on broadcasting frequencies and two interference frequencies); on the Radio Cymru aerial and on the UHF television aerial. Already these results have been useful. The engineers now have a record of the true radiation pattern of the VHF and UHF aerials at Wenvoe.

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