

Long Live Vivat!

Jeffrey Borinsky and Paul Marshall

When we wrote about some of our outside broadcast (OB) trucks in the Winter 2019 Bulletin, we said a little about *Vivat*, our oldest truck, but this fascinating project deserves a closer look. It is a re-creation, as near as is technically possible, of an OB truck that was used at the Queen's coronation on 2 June 1953.



Inside *Vivat* as found

For television in the UK the coronation was a coming of age. Before it, TV was a minority interest; afterwards it was well on the way to surpassing radio as popular entertainment. It was the largest ever OB in the UK. In the coronation text, the monarch is crowned 'in the sight of all the people'. For the first time this approached being true. About 20 million people saw her coronation live on TV, more than had ever seen a British monarch being crowned before.

But the TV OB very nearly didn't happen. The establishment wasn't keen on having cameras inside Westminster Abbey but they were overruled by the young Elizabeth. She was acclaimed with the cry: *Vivat Regina!* This is why our project is called *Vivat*.

We have tried to be as true as possible to an early 1950s BBC OB truck. The cameras, monitors and much other equipment are authentic. The vehicle isn't quite, it's about 10 years younger, though it's remarkable how little the design changed in that time. 390 EXX started life in 1963 as the BBC's MCR23 (Mobile Control Room) but reached us a derelict mobile classroom.

In this article we'll show how a rotten hulk was transformed into a gleaming OB truck, fit to appear in *The Crown*.

The vehicle

When we acquired *Vivat* it had suffered a combination of adaptation, vandalism and neglect. Some of the problems were with the bodywork, which is aluminium over steel and ash. It had rusted and rotted in places.



Collecting the hulk



Starting to strip out *Vivat*

Another problem is getting mechanical spares. Unusually for a truck, *Vivat* has a petrol engine. This was a BBC specification, on advice from the military. It was believed, incorrectly, that the vibration from a diesel could shatter delicate valves in the broadcast equipment.

Many spare parts are scarce or unobtainable. The starter motor and the wipers needed repairs; we were fortunately able to source spares. Although it's theoretically possible to machine new metal parts, recreating rubber ones would be trickier. Another

problem is that, long-term, brake fluid tends to damage rubber components. We have had long and inconclusive discussions about which is the best brake fluid to use.

Sam Booth drives and nurtures our trucks. He says that *Vivat*'s 4.75l engine is 'dinky compared to today's engines.' And it has a 'huge steering wheel' which means that you are sitting quite a way into the body of the truck when driving. *Vivat* hasn't, Sam says, 'got low-down torque and it goes a lot better when it's warm.' He added, 'you are driving by the seat of your pants.'



Is the paint holding the rust together? Or the other way round?



Paul with his favourite tool



Unrestored Mk III cameras etc temporarily stored in Vivat



Partially restored Vivat at our base near Lincoln. The horse really isn't interested

Inside Vivat

Apart from the vehicle and all the electronics the interior had to be stripped and refitted.



Formica and fibreglass fitted by Martin and Richard.



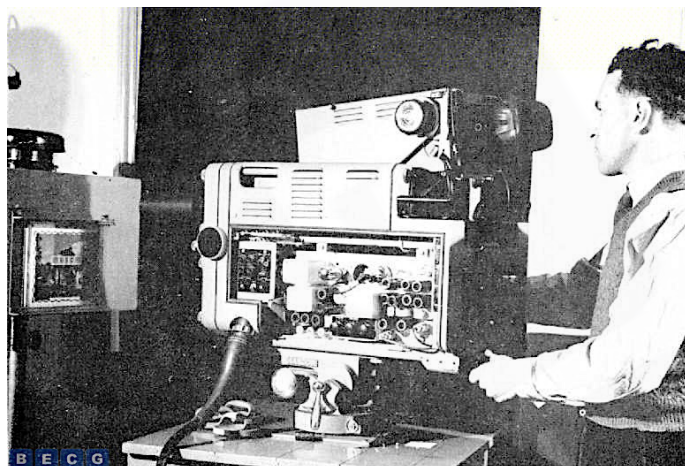
Jill and Margaret making seats



Kee Lite alloy tube was used to support the monitor stack and other electronics

Cameras

To be strictly true to the coronation we should be using Marconi Mk II cameras. We have two of these but restoring them to working order is a difficult long-term project. This is why we have used the slightly later Mk III cameras. Other equipment, including camera control units and monitors, hardly changed between Mk II and Mk III.



The resolution of a complete camera channel being tested. Cyril Teed of test division has this camera trained on a special transparent photograph of a picture which might be seen in a normal outside broadcast. It is Ilford's picture of Kersey Village, and it has test lines superimposed on it 'The Marconi Companies and their Peoples', Vol 6, No. 7 February 1956 p20



Lens turret assembly in Section 15. J. Warner, chargehand centre, with R. Wood, right, who is fitting turret bearings, and G. Murdy, left, fitting the filter ring 'The Marconi Companies and their Peoples', Vol 6, No. 7 February 1956 p18

A new Marconi production line

Getting cameras to a fully working condition has been a major undertaking. At the old Marconi New Street works in Chelmsford, Mk III cameras were built on a production line, so we re-created the process in miniature to refurbish three cameras to "as new".

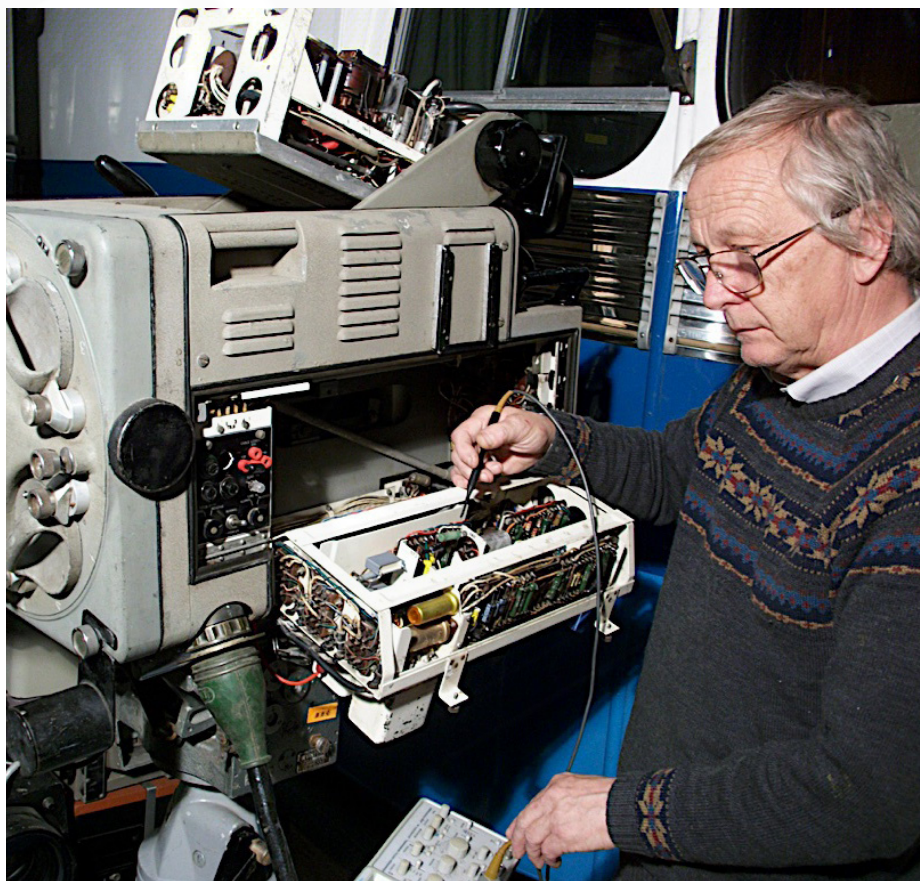
The goal was to have a fully functional unit with three working cameras restored to a standard as close as possible to mid-1950s practice. It will be the oldest fully operational OB truck anywhere in the world and it has to be right. The process has required a large investment of time, money and resources not just into the truck itself but also in restoring and testing a huge amount of mid 1950s Marconi broadcast television equipment. All the restored items must be safe, as authentic as possible and reliable for proper use.

Some of these goals conflict and it's a question of balance – new components or refurbish, exposed live terminals or cover, re-paint or call it 'history'? Just as vintage aircraft are best appreciated when flying, period outside broadcast trucks and their cameras need to be seen working.

Star attraction

Of course, it's not just about cameras. There's all the support equipment including vision and sound mixers, monitoring, communications and test facilities. That said, the working cameras will always be the star attraction.

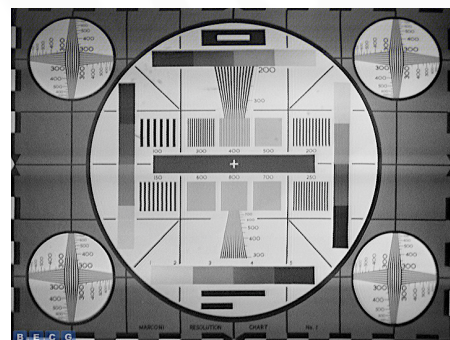
With most of the restoration of support equipment complete, attention in the last few months has turned to bringing all three cameras up to operational status at as high a standard as possible. The minutiae of decisions taken on a daily basis can be overwhelming but staying focused on the goal has been a good motivator. Nowhere has this been more apparent than in the work to produce the truck's three fully operational Marconi Mk III 4½" Image Orthicon TV cameras.



Paul working on a Marconi Mk III camera head

On the production line

The need for three cameras has meant working rather like a production line. We have changed many hundreds of defunct 60-year old capacitors, replaced and dressed wiring, and carried out deep cleaning and painting. We have sourced damaged and missing components and done in-depth technical testing to ensure correct functionality. Where possible and appropriate, we have built test jigs for sub-units that are best tested on the bench. These include ones for viewfinders, low-noise head amplifiers, power supplies and picture monitors.



Actual picture from Camera 1 looking at a test chart

We have pictures

All three cameras are now complete and ready to take their place in *Vivat*. There are still items for the pre-delivery snag sheet such as 'why doesn't the iris meter work on Camera 2?'. Fortunately, BECG is the customer and we won't be facing the dreaded factory acceptance test.

Monitors

The cameras are the most visible part of a restored truck; without a reasonably correct set of cameras you can hardly claim to have a successful project. There's also a lot of less glamorous equipment. The next most visible parts are the monitors. Several of these are Marconi Mk III picture and waveform monitors. This means they have two CRTs: 10" for picture and a small oscilloscope-type tube for waveform. They give very high quality pictures. The Ekco TMB272 TV receiver dates from 1955. These were widely used as OB monitors and off-air receivers. All OB trucks are modified over their life so in *Vivat* terms this was a later addition.



Fully restored EHT module for a Mk III picture and waveform monitor. The original Visconol oil-filled capacitors are always faulty and have been replaced



Mk III camera test rig showing a picture and waveform monitor. It's sitting on a rack with a studio-style camera control unit and modern SPG



Vision mixer control panel installed in desk. Most of the electronics is in a rack



Interior of vision mixer control panel before restoration

Vision mixer

The visible part of the vision mixer is the control panel which is part of the main control desk. Ours was kindly de-accessioned by the Science Museum. It arrived covered in some kind of impenetrable muck; Paul spent much time and effort cleaning it. If we were to write about all the other equipment such as sound and talkback equipment we'd need another whole article.

405 or 625?

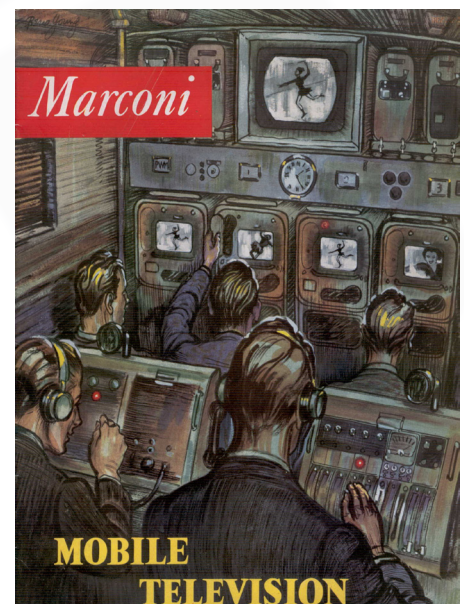
One vital question was whether *Vivat* should operate on original 405 lines or modern 625. Marconi designed their equipment with a view to export so most is capable of 625 line operation. Because we want to feed *Vivat*'s output into modern equipment – in November 2019 the BECG went live on-air to ITV News with our Southern truck – the obvious choice is 625. We also get slightly better picture quality. For those few monitors

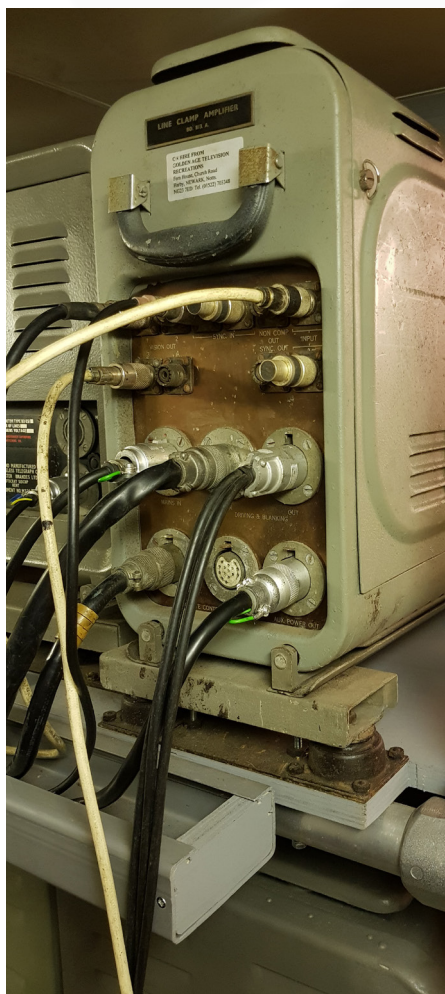
that are 405 only, we have bought some Aurora 625 to 405 converters. We would like to thank Darryl Hock, their designer, for supplying them at a very special price.

We now have some 405 to 625 converters so 405 operation is a possibility. It would be lovely to have a big switch and be fully dual standard but it would need a lot of equipment to be re-aligned at each switchover so we'll stay 625 for now.

Putting it all together

Compared to later OB trucks, *Vivat* has relatively little wiring but that's still plenty. As in so many parts of a restoration we had to make choices that balanced authenticity and practicality. We also have a small concealed rack with modern equipment that will give us greater operational flexibility. This includes an SPG, standards converters and patch panels.





Video processing amplifier before and after restoration showing PL259 and EP connectors. Some connections are still temporary – we shouldn't have any visible cream coloured co-ax

Cable and connectors

The common cream-jacketed, double-screened video cable had yet to be invented in 1953. Vivat would have originally been wired with a fairly slim black cable. When choosing a cable for Vivat it had to be black to look authentic, not too thick to fit in limited duct space, and compatible with available PL259 plugs. Today's RFI environment is more hostile than in the 1950s so we wanted double screened cable. We are very grateful to Bryant for donating a drum of suitable cable and their residual stock of matching PL259 crimp plugs.

The rugged EP series of connectors were widely used in broadcast equipment. They range from 2 to 18 pins. We have sufficient stocks of EP3 (audio), EP4 (mains) and EP8 (Marconi pulse distribution) but we still need some EP10, 17 and 18.

Power

Powering an OB truck involves a lot more than simply running out an extension cable to the nearest mains socket. We can't compromise on safety but fortunately Vivat's power systems are largely not visible so we have used modern techniques and components. This includes RCDs which weren't available in the 1950s. Despite the high power consumption, Vivat is inherently designed for a single-phase supply. Hence power input is now a blue 63 amp CEE17 connector.

It would be a step too far to replace the EP4 power inlets on each piece of equipment. They are largely inaccessible to casual visitors and safe enough when used with RCDs. If you're wondering why

we have a 4 pin connector for mains, it's to allow separate technical and safety earths. Alas there are 2 different wiring standards, Marconi and BBC/EMI. Since live is always pin 1, cross connections usually cause high earth currents which will trip an RCD. Since Vivat is equipped with Marconi kit, we use the Marconi convention.

Power usage is split into domestic, for lights, fans etc and technical, for cameras, monitors etc. An automatic voltage regulator stabilises the mains voltage for technical power. It works using a servo controlled Variac. Lots of iron and copper make it very heavy.

Vivat originally had batteries to supply rigging lights plus backup power to allow sound-only operation if the mains failed. To save weight and battery maintenance we're only providing 12V lighting.

A star is re-born

Vivat is already quite a star. She had her two appearances in the second series of The Crown. Soon she will be a fully working OB truck, the oldest in the world. A fully functioning piece of living history. A huge and worthwhile restoration, notably by Dave, Richard and Paul.



Broadcast Engineering Conservation Group

We are a small association of experienced and motivated professionals dedicated to the survival and interpretation of television history. We have come together to put elements that individuals have collected into the BECG. Whilst we are currently privately funded, this has not been a bar to achieving many successes in this field. We are now a registered charity.

We have many cameras, monitors, video tape recorders and all the less visible paraphernalia that are needed to make TV programmes. The biggest and most visible parts of our equipment are several outside broadcast trucks; this article is about the oldest.

Promoting and demonstrating vintage television is the main purpose of the group.

This article was written by Paul Marshall (chairman) and Jeffrey Borinsky (treasurer), both founding trustees of the BECG. Fellow founding trustees have contributed to this article and to the *Vivat project*:

Dave Hill (Secretary & Webmaster)

Martin Pritchard

Richard Harris

Phil Nott

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Photos: BECG members

The BECG is a registered Charitable Incorporated Organisation (CIO), number 1189469. The BECG is financed entirely by the founders and by private donations. If you would like to learn more about us, or help us in any way please email: contactus@becg.org.uk

More information on the trucks, their equipment and other BECG activities can be found at: <https://becg.tv>

Much of the equipment shown in this article is available to hire for film and TV production.



Vivat mains intake panels, old and new. Richard designed and built the new panel.



Control panel for automatic voltage regulator, affectionately known as Claude because it was made by Claude Lyons



Sam inspects Vivat as it goes off to shoot The Crown