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THE MARK VII COLOUR CAMERA MOBILE APPLICATIONS IN THE U.S

DURING 1965 it became evident to us at KUTV, as well as to many other broadcasters, that a requirement for live colour cameras was not very far off in our future. The major camera manufacturers had anticipated the colour market and were either delivering or were in the final development stages of radically new and sophisticated cameras. With this in mind we began to investigate not only the make and type of colour camera we would buy, but, also, how they could best be put to use in our particular market. Drawing on past experience with our monochrome equipment, it was decided at an early stage of the evaluation period that some of the cameras would be mobile, with colour video tape included, in order to obtain maximum use of the equipment and be able to provide needed services to advertisers, school athletic departments, and other television industry affiliates. A second prime requisite was that all major mobile equipment be fully and conveniently usable in the studio.

In addition to the technical specifications that should be evaluated on any equipment purchase, economic factors must be heavily weighted on a purchase as costly as colour. In a medium- or small-size market, the difference between profit or loss on some remote pick-ups can be determined by manpower requirements and auxiliary equipment that it may be necessary to rent.

Overall requirements dictated that any colour cameras purchased should have the following minimum specifications:

(1) Sensitivity should be high enough to allow us to make colour pick-ups in existing field-houses, stadiums and commercial and civic establishments, without having to install a large amount of extra lighting fixtures.

(2) Signal-to-noise ratio must be high enough to ensure that noise is subjectively unnoticeable at light levels of 100 ft candles, or perhaps less, which can often be encountered on remotes.

(3) Resolution capabilities should be 100% modulation at 400 lines.

(4) Stability must be such that set-up time is not unduly more than had been experienced with monochrome, with no adjustments required during pick-ups other than possibly changing light level or colour temperature.

(5) The capability of using 1,000 or even 2,000 ft of camera cable with no deterioration of picture quality.

(6) Weight of the camera and viewfinder low enough so that moving them to and from the van and setting them on scaffolding or platforms can be accomplished without extra manpower or equipment.

(7) As cameras would be used in the studio as well as on remotes, a highly desirable feature would be the capability of remoting the important operating controls.

After careful evaluation of all available colour cameras, we decided that our needs would best be met by the Marconi Mark VII, which uses four Plumbicon® pick-up tubes.

® Registered trade mark, Philips Gloeilampenfabrieken.

Fig. 1. One of the four Mark VII colour cameras used by KUTV to cover the Stanford versus Washington State ball game.

Early in 1966 we contracted with the Ampex Corporation to purchase four Mark VII cameras, two of which would be mounted in a mobile van, with a VR–1200 high-band recorder, and for the versatility and smoothness of operation they offered, we chose fully servoed lenses for all cameras. To gain the benefits of high quality, reliability, stability, low heat generation and optimum use of space, we also elected to use only solid-state designs for the other van equipment.

Although it was determined that the van need not be as large as is often required for most network pick-ups, we did intend to make it available for network use; so plans were made to have it constructed in a form so that it could be easily interconnected with other mobile units. Actually, this put similar requirements on construction and layout that we needed for our own use in being able to slave the van equipment to our studio. This consisted partially of having all video, pulse and audio lines loop through a panel accessible from the outside at the rear of the van, before terminating at their normal connections inside.

The interior is divided into three areas: driver's compartment, video-tape area, and operating area.

The operating area is subdivided into production centre and video operating section. There are also tape storage racks and several cabinets for storing manuals, test charts, spare parts, etc.

The equipment is mounted in three racks and a custom-built console. Rack one contains the colour programme and match monitor, jackfield, sync generators with colour gen-lock, colour bar generator, distribution amplifiers and video switcher. Space is also provided for special effects generator and vectorscope. Racks two and three contain camera control units, encoders, power supplies, intercom and other monitors, including preview, camera, VTR, slide and auxiliary. The console houses the switcher control panel, clock and timer, VTR remote controls, audio console, slide camera control and the Mark VII operational control panels. To the side and behind the console is mounted an audio recorder, slide projector and slide camera.

Frequently, remote pick-ups are undertaken that need two recorders and very often requiring more than two cameras so construction of the van is such that either one additional recorder, or two additional cameras, can conveniently be mounted in the video-tape area. We have on several occasions used a third camera. Design of the Mark VII channel is such that the entire camera chain, with the exception of the pick-up head and viewfinder, can be mounted in one short rack with picture and waveform monitoring facilities. The operational controls can then be remotely operated up to several hundred feet. The rack-mounted components of the two cameras that we normally leave in the Master Control area are both mounted in such racks. Either, or both, of these can be wheeled into the van, bolted to pre-installed mounting brackets, and the prelaid cables connected. After initial set-up, all necessary operational controls are then transferred to the operating position thus giving the video operator control of all cameras.

Accessible from the outside are compartments for

Fig. 2. This versatile colour mobile uses a combination of one or two video-tape recorders and two, three or four Mark VII cameras.

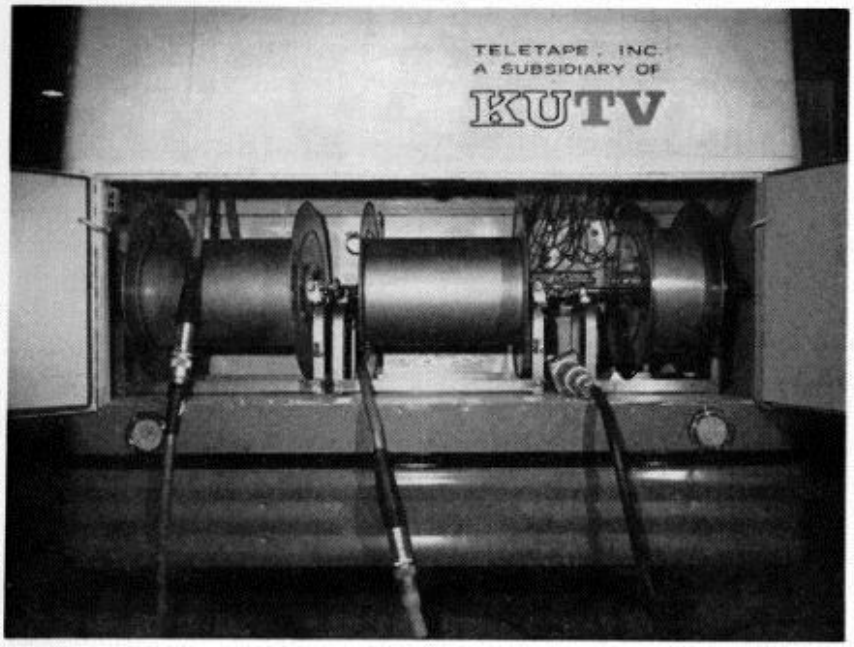

Fig. 3. Cable stowage at the rear of the truck.

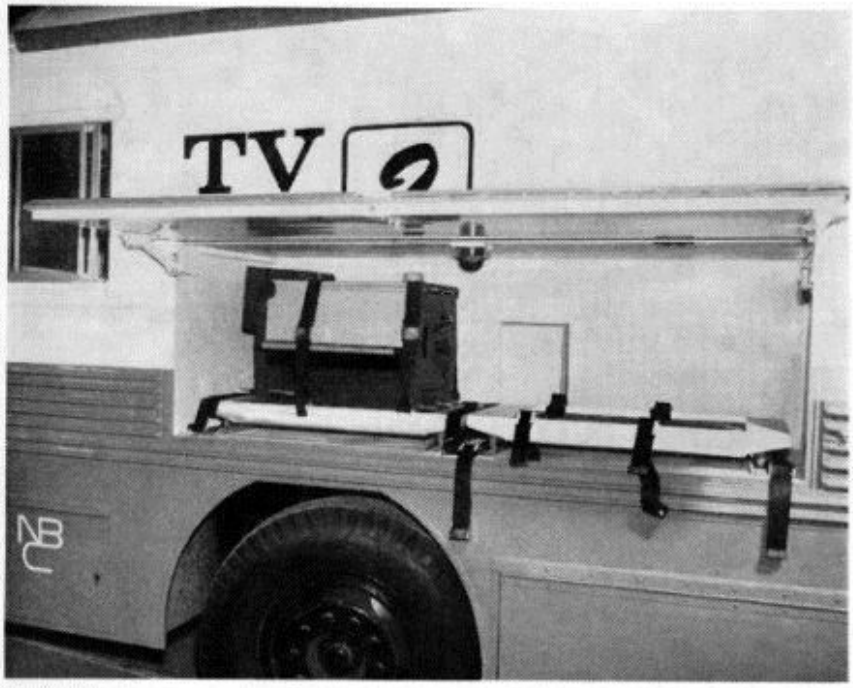

Fig. 4. Stowage for two Mark VII colour cameras.

storing cameras, zoom lenses, tripods, dollies and the balance of the many items needed for remotes. At the rear, accessible through a double door, are two camera cable reels, each with a 300 ft capacity. Also, in this compartment is the umbilical panel and the connection for external power. This panel is where all video, pulse and audio connections route through when the van is connected to the studio and where the same cables loop back to corresponding connections inside the van for remote use.

On top is a camera platform, a removable winch for lifting cameras and three separate air conditioners, totalling 4½ tons of air conditioning. A separate truck carries a 25kW generator and addition cables, etc.

When used for studio productions, the van is

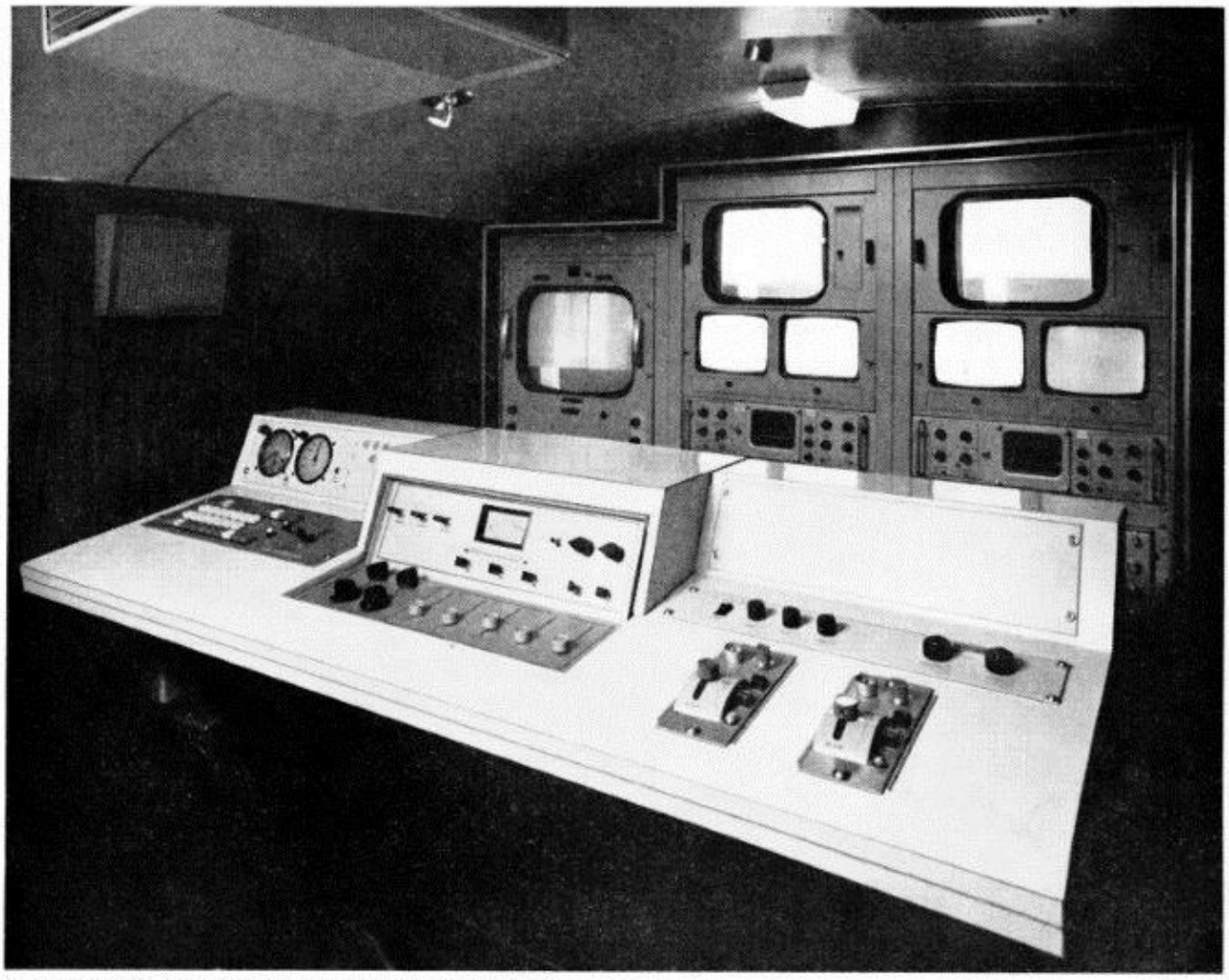

Fig. 5. The operational control and monitoring area in the vehicle.

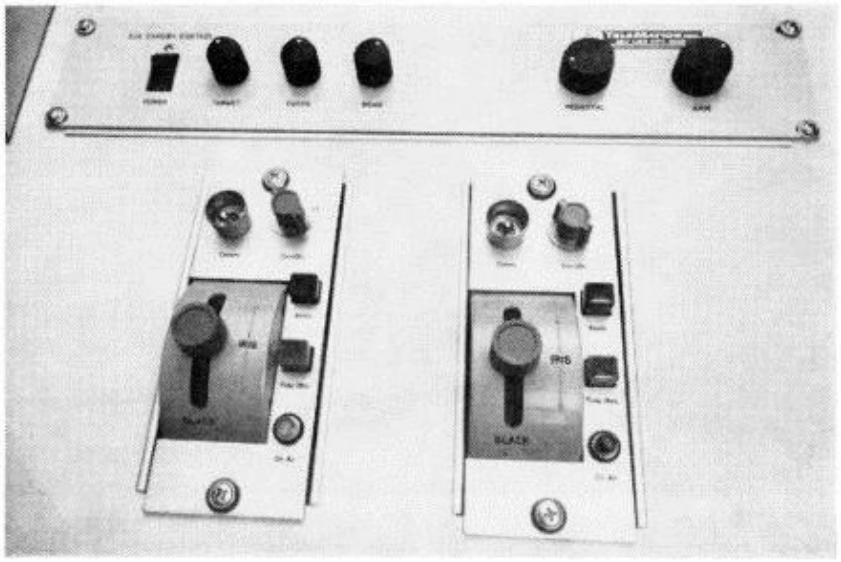

Fig. 6. Camera control for two Mark VII colour cameras.

backed into the building where one of its doors mates with a door in the studio control room. A removable step is laid between the control room and van doors and a canvas shroud snapped into place between the two doors. The van then becomes simply another room next to the control room. The cameras and VTR machine are checked out and all required controls remoted through the umbilical to the studio control rooms.

Remote pick-ups so far include commercial locations, indoor and outdoor sporting events, political functions, stage shows, art shows and others. These have been carried out using nearly every type and combination of lighting; conventional incandescent, tungsten halogen, fluorescent and some carbon arc. We have picked up field-house sporting events where the light level was considered even marginal for monochrome cameras; from a maximum of 100 ft candles down to 25. Under all conditions we were able to adjust for excellent pictures.

The inclusion of comprehensive set-up and monitoring facilities, such as independent signal polarity reversal for each of the four channels and bridging switches which allow the operator to tie all channels together at several points in the system, makes it quite easy to set up the camera and to train new operators in its use. One feature that has been especially appreciated for outdoor use is the inclusion of two separate filter wheels. Neutral density and colour filters can be separately changed as required.

Already we have reached an average use of over 2,200 hours' service with each camera. One Plumbicon tube has been replaced, which developed extreme porthole shading and random white specks on the target to such an extent that it was completely unusable. Three or four months after being taken out of the camera, the tube was put back in for a check. The porthole shading had nearly disappeared and the target blemishes seemed to be less pronounced. I will leave the explanation for this up to the tube engineers, but we now plan to keep it as an emergency spare.

Overall the Mark VII is an excellent camera for mobile use. Its resolution and sensitivity make it satisfactorily usable in any practicable situation and it is designed to be and is extremely versatile.