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## NEW MOBILE TELEVISION FOUR CAMERA AND VIDEO TAPE RECORDING VEHICLES

**T**HE PROVISION OF PROGRAMMES for television is something that gives constant thought to television operators. It was realized soon after the start of television that it could not be confined to the studio. Too many events which were pre-eminently television material took place away from the studio, and very soon the Outside Broadcast Vehicle was brought into being. As television developed over the last quarter of a century the thirst for programme material has grown, and with it a demand for higher quality.

One solution to this demand has been the evolution of television recording vehicles, which can move from place to place recording events of importance and interest. As these events can range from outside sport-

ing events to recordings of theatrical performances, etc, it is essential that the full facilities that would normally be obtainable in a studio should be available if the high quality demanded by television organizations is to be attained.

A novel television recording unit has recently begun operation in Europe. InterTel A.G of Zurich, a subsidiary of Intertel N.V of Holland, ordered this two-vehicle unit from Marconi's for the purpose of making videotape recordings throughout Europe. Already, it has operated in Germany, Austria, Switzerland and the Scandinavian countries, and at the World Figure Skating Championships in Prague. During the summer it has recorded a series of shows in France, Germany, Denmark, Sweden and Italy for the



Fig. 1. Production and Recording Vehicles in motion.

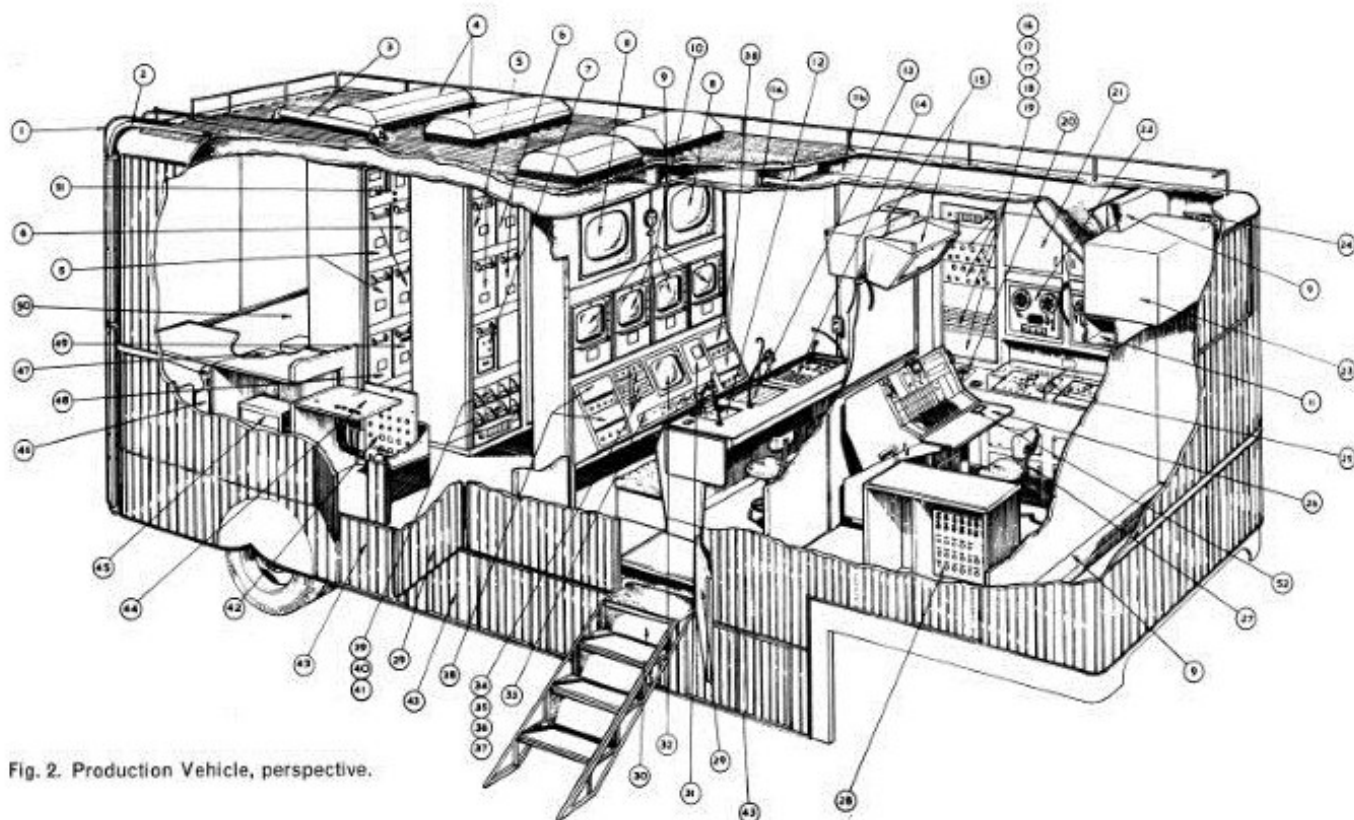


Fig. 2. Production Vehicle, perspective.

National Broadcasting Company of New York. Its recordings range from full-scale drama productions to "on the spot" news items.

The unit has been designed to meet InterTel's requirement that it should accommodate all the equipment normally associated with an equivalent comprehensive studio installation. It was also required to be able to make recordings whilst on the move. The "hands off" operation of the cameras was considered essential to the basic design of the vehicles, and this is the first O.B. vehicle to use this technique. A wide range of mixing operations including special effects is incorporated. The recording vehicle contains the Ampex Videotape\* recorders.

The advanced design of the vehicles makes them the most up to date in existence, and details of their design and construction are given in the following pages.

#### CAMERA VEHICLE

This vehicle is divided into three separate sections (Fig. 2):

- (a) Equipment.
- (b) Production Area.
- (c) Sound Control.

#### Equipment Area

At the rear of the equipment area provision is made

\* Registered Trade Mark

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|---|--|
| 1 Extending Ladder                            | 27 Precision Amplifier Stowage                         |
| 2 Camera Hoist                                | 28 Sound Termination Panel                             |
| 3 Cable Tensioning Device                     | 29 Access Door   |
| 4 Ventilators                                 | 30 Detachable Steps                                    |
| 5 Camera Control Units Type 5152              | 31 Tektronix Waveform Monitor Type 527                 |
| 6 Power Supply Units Type 3394                | 32 Picture Monitor Type BD. 878                        |
| 7 Sync. Gen. Type BD. 868                     | 33 Camera Remote Control and Engineers' Talkback Panel |
| 8 21-in. Picture Monitors Type BD. 850        | 34 Line Clamp Amplifier Remote Control Panel           |
| 9 Cable Duct                                  | 35 Sync. Gen. Remote Control Panel                     |
| 10 Picture and Waveform Monitors Type BD. 873 | 36 Electronic Switch R/C                               |
| 11a Air Duct (return).                        | 37 8-way Preview Switching Panel                       |
| 11b Air Duct (flow)                           | 38 Camera Control Panels                               |
| 12 Directors' Talkback Panel                  | 39 Pulse Distribution Amplifiers                       |
| 13 Special Effects Control Panel              | 40 Vision Distribution Amplifiers                      |
| 14 Vision Mixer Type BD. 920                  | 41 Mains Distribution Panel                            |
| 15 Loudspeakers                               | 42 Vision Termination Panel No 1                       |
| 16 Mains Distribution Panel Type 5350         | 43 Stowage Compartments                                |
| 17 Two Pultec Equalizers                      | 44 Vision Termination Panel No 2                       |
| 18 Sound Jackfield Panel                      | 45 Automatic Voltage Regulators                        |
| 19 Sound Termination Blocks                   | 46 Image Orthicon Tube Stowage                         |
| 20 M.I.M.C.O. Audio Control Panel             | 47 Cameras in Stowed Position                          |
| 21 Tape Storage Cupboard                      | 48 Electronic Switch Type 6155                         |
| 22 Ampex Tape Units Type 351                  | 49 Communications Unit Type BD. 887                    |
| 23 Air Conditioning Units                     | 50 Access to Camera Stowage                            |
| 24 Inlet Louvres                              | 51 Regulated Power Supply                              |
| 25 Tape Control Units                         | 52 Audio Tape Remote Control                           |
| 26 Sound Control Console Type BD. 966         |  |

for the mounting of four Marconi Mark IV Image Orthicon Camera Channels on a retaining rack which folds up on to the rear wall when not in use. To remove the cameras from outside the vehicle a large hinged flap is fitted. Adjacent to the cameras is a work-table with cupboards beneath, in which is fitted a three-phase 20-kVA automatic voltage regulator providing 117 V for all the technical equipment and ancillaries in the vehicle. Provision is made adjacent to the cupboard for four padded compartments housing the image orthicon tubes when not in use.

Four 7-ft studio-type cabinets contain the camera control units, power supplies, mixer electronic equipment, transistor sync generator, line clamp amplifier, multiburst generator, vision and pulse distribution, etc. These are situated adjacent to the nearside wall in two banks with sufficient room between each bank for a mobile oscilloscope to operate. The heat generated by the equipment in the cabinets is removed by four extractor fans fitted in the roof, and the easy flow of air through each cabinet is facilitated by floor louvres.

All the interconnecting cables are taken through a wide duct run in the centre of the roof through the complete length of the vehicle. Removable perforated hardboard panels give access to this duct.

A light alloy framing holds four picture and waveform monitors (BD873), two 21-in. picture monitors (BD850), and the camera control panels, the fronts of which project into the production compartment. Two extractor fans in the roof over this area remove the generated heat of this equipment.

A large mains switching panel is provided containing the main on/off switch for the vehicle mains supply, together with miniature circuit breakers for the individual technical equipments. Each incoming mains phase is checked on a volt and ammeter. Behind this panel is the vision termination panel, containing all incoming and outgoing vision circuits together with four camera cables, these latter cables being permanently laid in the vehicle and connected to the camera control units. A wide duct entering through the roof of the vehicle brings all the cables to this termination panel, thus ensuring a tidy appearance.

#### *Production Compartment*

Entrance to the production compartment is through a door on the nearside of the vehicle adjacent to the rack holding the four picture and waveform monitors.

In this compartment is a production desk on which is mounted a twelve-input relay vision mixer control panel (BD920) with A/B cut and preview switches, together with a special effects control panel, and also a commentator's talk-back panel and an intervehicle loudspeaker/microphone panel. A technical director, producer or director and a script reader normally occupy the positions at this desk, and they all have an excellent view of the four preview picture and waveform monitors and preview and transmission monitors in the fascia panel.

The vision operator sits well down out of sight of the director in front of the production table. Under his control are the four camera control panels, remote

camera control panel fitted with iris and lift controls for each camera, and the remote controls of line clamp amplifier, sync generator and electronic switch. An eight-way preview switch together with a 14-in. precision monitor and a separate waveform monitor enable the vision operator to select the outputs of the four cameras, special effects and remote inputs. A coaxial patching panel containing all the vision circuits is placed at the right-hand side of the vision operator.

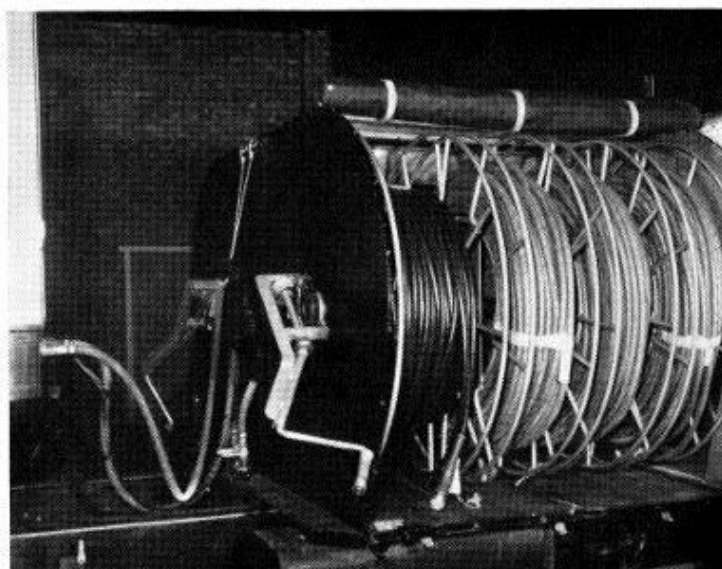
Programme sound and studio talk-back are relayed through a loudspeaker mounted at high level behind the production table.

#### *Sound Compartment*

Entrance to this compartment which is at a higher level is through a door in a bulkhead dividing this area from the production compartment. A double-glazed window gives the sound mixer an uninterrupted view of the 21-in. picture monitors over the heads of the production personnel. Provision is made for a ten input "Minor" sound console (BD966) which is equipped with fading for three groups of microphones. High-level inputs to this console are provided by two Ampex audiotape recorders mounted on the offside wall of the vehicle in a vertical position. These tape recorders are fitted with special hinged assemblies which enable the units to be pulled forward for on-the-spot servicing. The control panels for these latter units are mounted on a table immediately below the main assemblies, and their remote control panels are placed on the script table of the sound console. One recorder has normal mon-aural facilities whilst the other is complete with stereo controls. These recorders can operate with substitution of motors on 50 or 60 cycles.

Audio monitoring facilities are provided by a loud-

Fig. 3. Cable drum stowage fitted to tug of production vehicle.





speaker fitted at high level above the bulkhead window.

Two sound equalizer panels and a large external jackfield are fitted in a 19-in. racking frame alongside the audiotape recorders. A loudspeaker panel is provided adjacent to the sound console microphone enabling the operator to have direct speech contact with the technical director and video tape vehicle.

To facilitate audio synchronization with a video tape recorder an Ampex precision amplifier with a 50-cycle tuning fork is provided, mounted in the cupboard area below the audiotape recorder control panels. Stowage for the various pieces of sound equipment and tape recordings are provided in a cupboard behind the sound mixer on the nearside wall, behind which is the audio termination panel carrying all the microphone inputs and outgoing audio lines.

Air conditioning is provided for the sound and production compartments by two 1½-HP compressor units mounted at the front end of the vehicle at high level. Air is passed from these units through a duct in the roof on one side of the vehicle and the recirculating air returns through a similar duct on the other side. The control panel for these units is immediately behind the technical director in the production compartment.

Portable 1-kW floor heaters are provided at all the operating positions throughout the vehicle.

Access to the roof is by way of a ladder fitted at the rear of the vehicle; the bottom section of this ladder can be removed for use elsewhere, but is strapped down whilst in transit. The roof is covered with hardwood slats providing a walkway for camera operators and a position for a camera tripod together with lock-down is also provided. A tie rail for cables, and also affording some protection for operators, is fitted round the roof of the vehicle.

To facilitate hauling cameras and tripods to the roof, a novel single-arm boom is fitted at the rear corner of the vehicle. This boom is lowered and clamped down when the vehicle is in motion. A nylon net capable of holding various equipments is attached to a hook on the top of the boom and is hauled up by means of a winch tackle and nylon ropes.

Also on the roof is a tension spring device to which is attached the interconnecting cable harness used when recordings are made with the vehicle in motion.

The semi-trailer body is fitted to a Hands trailer unit complete with fifth wheel coupling. The construction of the trailer provides spacious lockers below the main floor of the vehicle. These lockers, which

are fitted with self-cancelling time switches for the battery-operated lights, house the many loose items of equipment which accumulate on vehicles of this nature, including tripods, friction heads, lenses, microphones, spares, etc.

At all the operating positions, individual script lights are provided of the car rally type with adjustment of the iris. These lights are run from a 6.3-V supply and their spread does not interfere with the operation of a production which is normally carried out in a subdued light. Twin 60-W fluorescent lights are provided throughout the whole of the vehicle, and for emergency use 12-V battery-operated lights are available.

Cable drums for camera, vision, interconnecting sound, communication and power are fitted in a drum rack on the Bedford tractor unit (Fig. 3). A handle on each side of this rack drives a crown wheel and pinion, and spring-loaded clamps permit winding of individual drums. Weatherproofing to this rack is provided by a canvas roll-up blind.

All doors and lockers are fitted with customs rings to enable complete sealing of the vehicle when passing through different territories.

When recording whilst in motion, a special camera mounting platform known as a "cow-catcher" is fitted to the front of the Bedford tractor. This "cow-catcher" mounts a Mark IV Camera on a friction head. Normal pan and tilt are provided by the friction head, but extra panning facilities are provided because the camera mounting can rotate through 180°. The camera operator sits on a motor-cycle type seat astride the "cow-catcher". The whole assembly is normally stowed on the cable drum rack when not in use.

When roving recordings are made it is obvious that good communication between drivers of both vehicles and the Technical Director should be possible. By the use of the transistor communication unit (Type BD887) a two-way conversation on telephone headsets between these people is provided. The communication unit also caters for the very comprehensive arrangements between all members of the talk-back production team.

The cameras and associated equipment can operate on either 405, 525, 625 lines and 50 or 60 cycles.

#### **VIDEO TAPE RECORDING VEHICLE**

This vehicle is very similar in external appearance to the camera vehicle but internally is divided into only two compartments (Fig. 4).

- (a) Video Tape Recording Area.
- (b) Maintenance Area.

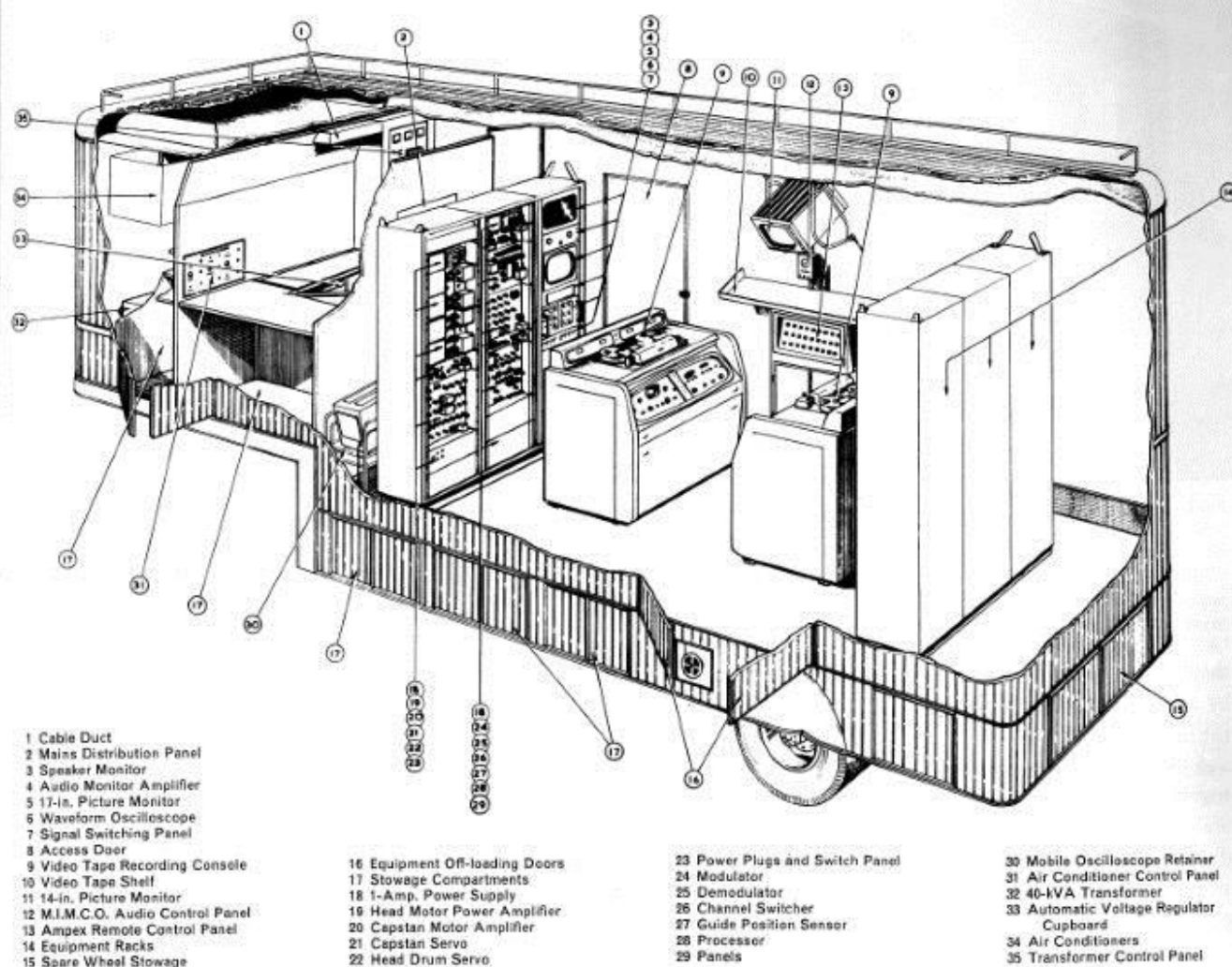


Fig. 4. Recording Vehicle, perspective.

### Video Tape Recording Area

Occupying the major portion of the semi-trailer unit this area is fitted with two Ampex Videotape recorders (Type VR1000C), complete with interswitch and monitoring equipment.

The two recording consoles face each other in the centre of the vehicle with the associated electronic equipment, processing amplifiers and monitoring equipment in three 7-ft equipment cabinets placed behind each console.

Between the two consoles on the offside wall at high level is a 14-in. picture monitor which is used mainly for editing purposes and comparison of pictures from the video tape recorders. Below this unit is a sloping table on which recording reels are laid whilst editing is in progress.

The majority of productions are recorded simultaneously on both recorders and as only one operator

is present to supervise the video tape recorders, a remote control panel containing the main switching functions for both recorders is placed beneath the editing table. Provision is also made on this unit for the video tape operator to speak to the sound mixer.

### Maintenance Area

All the electronic equipment is fed from a three-phase 20-kVA voltage regulator which is placed in an enclosed area in the maintenance compartment. This area is situated at the front of the vehicle in the stepped position above the fifth wheel coupling. A benchtop table covered in formica around two walls gives adequate room for servicing of electronic units. Suitable cupboards and drawers for stowage are fitted in the area below this bench.

To cater for the various mains sources to be found on the Continent a special input transformer is an

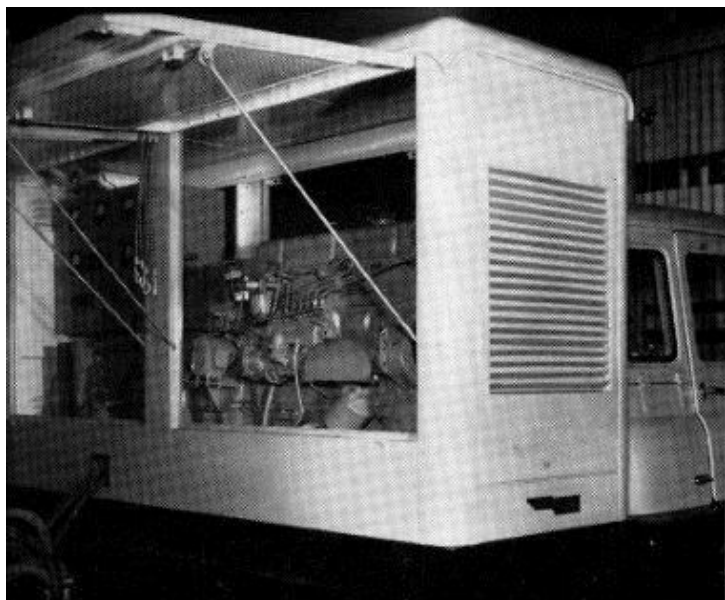


Fig. 5. Diesel Alternator fitted to tug of recording vehicle.

essential requirement. This transformer is situated on the floor at the front of the vehicle, and is controlled by a main switching panel fitted on the rear wall of the maintenance room. Full metering for the incoming and outgoing mains supply is available on this panel together with incoming voltage changeover switch and main circuit breakers. This panel feeds the vehicle distribution panels of both camera and video tape vehicles, the panel for the latter vehicle being mounted on the dividing wall to the maintenance compartment.

It was found impracticable to ventilate this vehicle and at the same time remove the heat generated by the equipment in the conventional manner by separate extract fans, because the position of the consoles and the heat-generating portions of these units would have required very careful and, indeed, expensive ducting to ensure that the extracted air did not interfere with the air conditioning. Air-conditioning equipment was therefore installed to cope with the heat generated by both the console and cabinet mounted equipment as well as the operators and other personnel working in the vehicle. The air conditioning consisted of three  $1\frac{1}{2}$ -HP compressor units fitted at high level in the front of the vehicle, the control panel for which is situated in the maintenance compartment. A similar arrangement to that for the camera vehicle is made for distributing the conditioned air by way of ducts in the roof. Both flow and return ducts are insulated to cut down the noise level of air passing to the conditioned areas. Suitable adjustable grilles each occupying an area of 144 sq in. are placed at intervals throughout the length of the vehicle in both flow

and return ducts. Each of these grilles is adjustable to maintain a comfortable flow of conditioned air.

As on the camera vehicle ample stowage space is available in the underfloor lockers for the numerous items of equipment which inevitably accumulate on this type of vehicle.

Only one main entrance door is provided in the video tape vehicle and this is situated on the offside of the vehicle. However, to facilitate the removal of the video tape recorders a pair of double doors are placed on the nearside towards the rear of the vehicle.

The tractor unit houses behind the cab a 40-kVA Diesel electric generator unit (Fig. 5), capable of operating on 50 or 60 cycles. This unit is fitted across the chassis members and access to the engine and alternator is made from either the front or the rear. The fuel consumption of this unit is approximately three gallons per hour and the fuel tank for this unit is placed alongside the main fuel tank of the tractor unit. By means of a changeover switch the Diesel alternator can use the fuel in the tank of the tractor unit if supplies run low and vice versa. The tractor unit can also use the fuel tank of the Diesel alternator.

#### *Construction*

There were two reasons for choosing the prefabricated, interlocking sections used in the construction of the vehicle, in preference to the conventional method of wooden or aluminium framing faced on one side by light aluminium sheets and on the other side by laminated panelling. The first was because with the overall length of the trailer, for appearance sake, the least number of exposed rivets on the external face would give a clean and tidy appearance, and indentations, particularly apparent when rivets are used on aluminium sheet, would be eliminated. Secondly, the construction by its very nature was much more solid and less liable to movement, and the ease in fitting the panels together cut down the coachbuilding time considerably.

The method employed in construction of the vehicle was carried out in four main stages:

- (i) Laying of main floor levels and locker floors.
- (ii) Fitting of side panelling and roof members.
- (iii) Lining of internal walls and ceiling.
- (iv) Fitting of trimmings, equipment rack and painting.

All side panels were cut to size before assembly to the main frame and then riveted on the inside before fitting the thermal insulation and laminated panel.

To cater for personnel walking on the roof, particular attention was paid to prefabricating the structure

of aluminium sections to withstand loads of up to four men and 4 cwt of equipment at point loads over an area of 8-12 sq ft. The roof was covered externally with aluminium sheeting, and thermal insulation covered by perforated hardboard on the inside.

Standard extrusions were used wherever possible for door trims and finishing waistband rail.

The vehicle was attractively painted with yellow

roof, silver side-walls and "standoff" large lettering in black along the sides and rear.

Lino tiles (6×6 in.) were used on the floor of both vehicles. These hardwearing tiles are easy to lay and were used in preference to sheet lino. Another point in their favour is that if last-minute changes have to be made in the floor during the course of construction it is relatively easy to remove the tiles.