INTRODUCTION

All Remotely Operated Vehicles carry some form of imaging system, the basic being a monochrome, low-light type, television camera. This is the minimum system and most vehicles also deploy a Colour TV camera and a 35mm or 70mm still photographics camera. Some applications (pipe survey) may, in fact, require two inspection (colour) cameras and some vehicles also have a rear view camera. Traditionally, the three separate functions (navigation, inspection and photographic still cameras) have been performed by cameras installed on vehicles as separate units and while this can be quite satisfactory, there are many cases where problems can occur and this separate unit approach may not give the optimum performance.

CURRENT PRACTICE

Navigation is nearly always carried out using a 1-inch Silicon Intensifier Target tubed camera. A SIT camera is very sensitive and gives good viewing in low light levels, in some cases with no vehicle lighting at all. This results in much improved performance in turbid water conditions as there is less backscatter from the lighting. The lens is normally fairly wide angle, giving a field of view of, say, 100° and because of this is not generally mounted on a pan and tilt unit.

The most popular colour camera for inspection purposes is the 3⁄4" single tube, striped filter type, generally using a Saticon or Newvicon tube. Both of these give good resolution (300 TV lines) and are reasonable sensitive, especially compared to the now outdated trielectrode Vidicon tube. Modern electronics has resulted in a steady reduction in size of colour cameras, the latest being only some 230 x 100mm, this is of importance both for installation on small vehicles and when mounting on the pan and tilt of the larger ROVs.

Where the highest quality of colour video is required, the 3-Tube Camera is the only choice. However, it is still relatively large, expensive and tends to be less sensitive, as light is inevitably lost through the dichroic mirrors or prisms used to separate out the 3 colours.

With regard to the still photographic camera, the 35mm format has become the most popular for general inspection work, the 70mm being used mainly for photogrametric applications.

Lighting tends now to be of the incandescent Quartz Halogen (QI) type, ranging in power from 90W up to several KW on the large vehicles. Discharge lamps tend are now less popular, as they are unsuitable for colour use and the
ballast unit required tends to be bulky. Strobes for the photographic cameras also need to be provided and range in power from 50 Watt seconds (joules) up to several hundred for some applications (pipe survey).

All the above equipment tends to be added to the vehicles as separate units, rather than being treated as a system, and while this can be satisfactory an integrated approach will always give better overall performance. Before outlining such an approach, some of the potential problems with an integrated system are as follows.

**Size**

The physical size of cameras, lamps, etc. is always a problem on the smaller vehicles, simply fitting them on, let alone in the optimum position, can be a problem. The extra weight can also affect the vehicle's stability. On the larger vehicles fitted with a separate pan and tilt unit, installing two cameras, say the colour and the still camera, on the one unit can be cumbersome. These two cameras, mainly used for inspection, really need to be mounted with their optic axis as close as possible to avoid parallax error between them. A typical colour camera (~" tube and 9mm lens) has a horizontal angle of view of approximately 50° which equates to a horizontal field of view of approximately 1 metre at a distance of 1 metre. A 28mm still camera gives a similar field of view, and if the two cameras are mounted at say 300mm apart on a pan and tilt, there will be a corresponding discrepancy in the field viewed by both cameras.

**Electrical Noise and Power Supplies**

Electrical noise is an ever present problem with vehicle video systems and is not confined to just multi-camera systems. Sources of noise on the vehicle include thrust controllers, lamp controllers, sonar, strobe and others. The modern practice of using switching power supplies rather than linear regulations can also give problems by producing a power supply for the camera which is inherently noisy. This can be aggravated if the supply is overloaded by the addition of several cameras which were not included in the original load calculations. The strobe is another source of noise as the majority contain a high frequency inverter, and if this is powered from the vehicle can produce considerable electrical noise. Extreme care should always be taken with remote head strobes, as the current pulse in the interconnecting wire is often in excess of 200 amps and induced voltage spikes in adjacent wiring can cause damage to other electronic equipment.