Two new advances in British computer technology:

EASAMS Architecture for Management and Control Systems (EAMACS) and Ferranti Computer Systems Indication of Microwave Propagation (IMP) System

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Within a week or so of each other, two major UK defence contractors announced advances in the use of computer technology which offer considerable, and so far probably unique, benefits in widely differing branches of defence technology. Both are software-based developments for which special programs have been developed, and each has a variety of possible applications. First to appear was the EAMACS (EASAMS Architecture for Management and Control Systems) unveiled by the EASAMS Limited member of the GEC-Marconi Electronics Group, and a couple of weeks later Ferranti Computer Systems Limited introduced its Indication of Microwave Propagation (IMP) System.

The former is essentially intended for command and control applications and related uses, although it has immense possibilities for a wide range of other purposes including simulation, training and planning. IMP, in its way, is equally versatile but is basically concerned with the prediction of radar and radio propagation and the application of this information to both attack and defence in most aspects of aerial warfare. In both instances development arose from practical experience of an operational task or problem which led to the evolution of a practical solution based on the application of new software to otherwise existing hardware and techniques. In the following paragraphs the EASAMS and Ferranti developments are described separately.

Flexible command and control

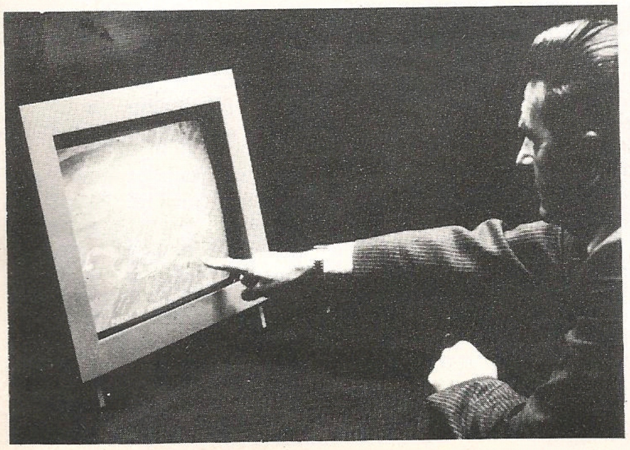
Awaiting the start of a demonstration of EAMACS on an installation at EASAMS' Frimley, Surrey headquarters, the most noticeable feature is the absence of controls. There is a television-style, raster colour display unit carrying a few manual controls for picture adjustment such as the average domestic television set has, but no banks of push buttons, roller-ball and alphanumeric keys normally associated with typical command and control operator positions. One wonders how the system can perform the numerous functions claimed for it, but the demonstration quickly reveals the answer. The man/machine interface is in fact the display, and operator access to the system is via the screen itself.

On switching on, a 'menu' of the available displays and system functions is presented automatically in the form of a numbered list, with instructions enabling the operator to select one. The necessary 'push-buttons' for selection appear in pictorial form on the screen and on touching the appropriate one the display changes to the appropriate form, together with any other 'push-buttons' that might be needed for operation of that function. This technique allows radically different operational tasks to be performed at the same display. For example, a continuously updated picture from an air defence radar network can be displayed, while by simply touching the screen, the picture can be changed to one showing satellite images which by a further touch can be filtered to permit analysis. The trials and demonstration installation at Frimley consists of a digital computer, a display controller, television video sources, colour television monitor and an infra-red touch-mask input system.

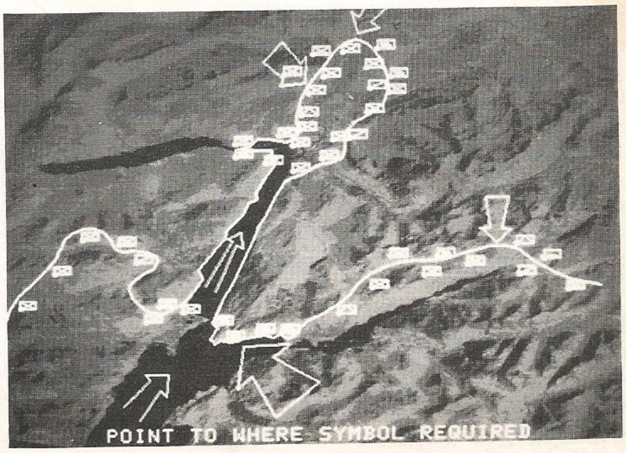
The last named is the device by which the operator communicates with the system, and consists of a frame surrounding the monitor screen that carries an array of infra-red emitters and receivers on its periphery. Pointing to a feature on the display interrupts the beams of infra-red light passing between the emitters and receivers enabling the position of the feature to be defined in x and y terms for input to the computer. The same device is also used to fulfil some of the functions usually performed by controls such as tracker-balls or 'joy-stick' facilities. A target marker, for instance, on an air defence situation map display can be repositioned by placing a fingertip over the marker and 'dragging' it in the desired direction until the marker is over the required new position.

The EAMACS system does not depend on the use of any particular computer or display equipment, and a number of alternative types of hardware can be employed without any change to the basic architecture or existing software. Thus the system is very suitable for retrospective incorporation in existing command and control centres, for instance, enabling many of the current items of equipment to be used. It may be used to display television video from closed-circuit television cameras, thermal imagers, or from random access video storage, as well as

The new EASAMS command and control systems architecture display in use. The operator communicates with the computer system directly via the display unit, the selection facilities are presented on the screen pictorially and pointing to the required function automatically brings the appropriate display on to the screen



Example of the typical tactical situation display overlay with a topographical presentation of the battle area derived from the stored digital land-mass map



for the compilation of suitable map displays (tactical situation, threat analysis, topographical, etc) and the necessary digital data base can be stored on whatever medium the customer favours; for example, magnetic bubble, magnetic tape, disc, or drum memories. The geographical data base employed in the demonstration installation for air traffic control applications is based on coast lines, national boundaries and rivers, and there are facilities for changes of scale, target labelling, and over-laying other information such as radar coverage, and the extension of this type of display to air defence purposes is readily apparent.

A topographical data base is also available in the demonstration system, and the exceptional range of applications of this software package, which is the brain-child of EASAMS' Robin Lovelock, suggests enormous scope for the system in both civil and military roles. From the basic digital landmass map data a contour relief map of an area can be displayed with heights denoted by varying shades of green, for example, or the presentation can be varied to one in which the differing shades are related to the slope of the gradient instead of the areas between contour lines. The result of the second presentation is to produce a synthetic picture showing the shadows cast by relief features such as hills and mountains. On to such displays additional information can be superimposed, such as built-up areas or other details of tactical significance, using other colours and with labels if required. A novel and impressive feature of this display is the ability to select a synthetically generated pictorial presentation of the actual view from any point on the original landmass map. The height of the viewing point can be selected by the operator (from sea-level up to any height), as can the direction and angle of viewing. This enables the coverage areas of radars to be assessed before they are deployed, or the probable limits of radio communication when using line-of-sight limited frequencies. A related program allows cross-sections between any two points on the map to be calculated and displayed and this, too, has applications in radar and communications planning.

Another possible use of this digital landmass display technique is its ability to show accurately how terrain will be seen from the air, assisting immensely with such vital tasks as target briefing for low-level air strikes, etc, and the days of the elaborate target models for this purpose seem to be numbered. It also allows alternative approach routes and attack heights to be assessed and compared well in advance, providing a valuable extra tactical planning facility.

EASAMS is demonstrating EAMACS to military, para-military (police, etc) and civil authorities at Frimley and Managing Director, H Surtees, told Jane's that negotiations with at least seven overseas countries have commenced. He expects the first sales of the system to be announced early in 1982, and confirmed British Ministry of Defence interest in the system.

The view in any direction, from any height and any position on topographical display can be called for automatically and is built up in a few minutes from the stored digital land-mass data. This photograph does not do full justice to the life-like picture presented by the actual colour display, which would be ideal for low-level air attack planning or target briefing

One of the air defence situation map presentations shown during the demonstration of EASAMS' new computer command and control system. 'Labels' for any displayed target can be called down by pointing to the target of interest

For or against Stealth

Practical experience, very much first-hand, of the uses of radar in air defence and culminating in 1980 as the commander of an RAF Shackelton airborne early warning squadron, led Wing Commander Philip Burton to formulate the concept of a system which would usefully apply the inconsistencies in radar performance which had often been an operational handicap in his service duties. The diverse vagaries of both airborne and surface radars which result in both seriously reduced detection ranges and in other instances in exceptionally extended ranges, are well known to all radar users, and generally lumped together under the term anomalous propagation, or anaprop for short. Burton's idea (knowing anaprop to be related to meteorological conditions) was to formalise the relationship within a computer program which incorporates data obtained on actual meteorological conditions in the atmosphere together with known radar parameters to enable predictions of specific radars in given areas. Official support for the idea apparently was slow in coming (though we understand this situation has since changed), and when he retired from the Royal Air Force Burton joined Ferranti Computer Systems Limited as a consultant to team up with Dr John Moon, a mathematician and programmer, to work on the system as a company private venture project.

The resulting computer program called IMP (Indication of Microwave Propagation) has already been studied by a number of potential users and investigations have been carried out for them by Ferranti. Various British Ministry of Defence establishments and agencies are also known to have become interested in IMP, among them the Met Office which is understood to have a programme for the development of meteorological drop-sondes for obtaining data in areas where no regular routine weather soundings