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THE DEVELOPING PATTERN OF MOBILE COMMUNICATIONS

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Introduction

In this article I propose to indicate how I would expect the communications system of the future to evolve, and I wish to draw attention to the vital role that you, the users, have in this process.

M.A.D.E.

The project which could establish the pattern of mobile communications for the future is known as MADE, or Mobile Automatic Data Experiment, and this is specifically concerned with the complex communications requirements of the larger police forces. All police and fire forces will, however, benefit from the work as it progresses.

MADE is an extremely complex project, so much so that it was necessary to employ a communications company with extensive specialist resources to undertake the work. I suppose we could define the object of the exercise as the study and evaluation of all the possibilities to see which of the many alternative and additional facilities justify adoption.

The Role of the User

Advances in technology have been so rapid during the past decade that one can confidently predict that almost any operational requirement can be met by the end of the next decade. We must ensure that we use this technology as an efficient servant, and that we are not carried away by the mirage-like attractions of each wonderful innovation. We must be quite ruthless in applying the essential criterion to every proposal - does the user get, or achieve that which he needs, and even if he does, is there a more economic way of doing so?

We are at a point in time when mobile communications, and I use the term to cover personal as well as vehicular communications, can be developed into ultra-complex and efficient systems capable of satisfying the needs of the most progressive police or fire officer. An analagous situation exists in civil engineering in that superior fly-overs and other attractive facilities can be built. The extent to which we adopt all such innovations must be a matter of careful study to ensure that we achieve our primary objective, which includes much more than the removal of specific communications obstacles. This invariably creates new problems.

You, the user, must state your true objective, and therein lies the main problem. Do you insist on the ultimate, or if not, how do you determine the proper compromise for your purposes?

As an example, it is now quite feasible to specify a pocket set that can identify and locate itself automatically, interrogate a computer, and act as a portable telephone capable of international calls. We might like to have such equipment if only to improve recruitment, but I hope that you will agree that, as usual, a compromise has to be made.

The Improvement of Present Facilities

Regarding the present facilities, there is no doubt that they fall short of the optimum.

The development of a new system of modulation designed to improve speech communications for the police and fire services is progressing very satisfactorily. This should facilitate the integration of pocket and vehicular radio systems, and confer an effective degree of privacy as well.

Another consideration is that the integration and co-ordination of public service systems generally is long overdue. Every major disaster highlights the need for this, and much has already been done.

This article, however, is concerned with the way in which mobile communications are likely to change, and I do not propose to discuss any further the ways in which we plan to improve the existing facilities. You may rest assured that a great deal of attention is being paid to the basic problems with which you are all too familiar, such as speech intelligibility and area coverage.

The Basic Data System.

Why was MADE necessary? It was realized when our studies began that one of the major problems to be faced was the essential need to speed up the transmission of information between police officers at base and their colleagues in the field, and to minimise clerical effort.

Studies of the message traffic on police channels showed that some 80-90% was routine and therefore capable of definition in standard message form. Thus standardized, these messages may be coded and sent by radio in digital form at speeds only limited by frequency allocation considerations, and a rate eighty or so times faster than speech might be adopted.

Speech and data may be interwoven on a common channel, and as far as I am aware all systems publicised to date fall in this category. This method however is not suitable for heavily loaded systems, and does not allow the full benefits of data to be obtained.

The use of a separate data channel permits regular automatic contact with every mobile unit, and the polling system being planned allows the polling of 1000 units each 30 seconds. With suitable procedures greatly improved personnel protection should result, and there are also many other important advantages which I propose to comment on later. One observation that I might make here is that the single-manning of cars should become more practicable.

All work done on data transmission must, of course, be correlated. It has been arranged that work on MADE will dovetail in due course with the work being done on the National Computer and the Birmingham Command and Control Project so that a comprehensive facility may be considered. I'll have more to write about this later.

The Study Group

To ensure a reasonable cross-section of police opinion five forces covering urban and rural areas, and probably subject to all types of police problems, were invited to participate. These five were selected because these forces were within range of one Home Office wireless site, and there was every reason to believe that all could benefit from the system.

A MADE Study Group has been active for over a year. This consists of police, industrial and Home Office representatives, and so far we have been defining the form of the initial pilot experiment. A common code has been agreed and several types of hard copy machines have been examined and tested as a preliminary to their incorporation in the pilot experiment.

A mock-up of a typical installation is on show, and we should be glad of your views on the practicality of this arrangement. Ergonomics plays an extremely important part in this study, since we must be sure that the layout and the presentation is the best possible, particularly in the confined space of a car.

Information on the detailed facilities to be examined have already been made available to all forces so I do not propose to refer to them in detail. The Study Group will assess their value, so some may be discarded and others extended as the work progresses.

After the pilot experiment it will be necessary to set up a large-scale operational experiment using fifty or more vehicles to permit a realistic study to be made of the effectiveness of the new system. The cost per vehicle is unlikely to be less than £1000, and could be well in excess of this if all the facilities are provided.

We are sure that everyone will take a keen interest in the progress of this experiment, but the harsh fact is that at some point the potential user must rigorously examine his requirements and determine the best compromise, for his application, between the ultimate and the basic system.

(These notes are being prepared in July 1971 and at present the Study Group has not reached a decision regarding the format of vehicle aerials and similar engineering matters of interest to the user).

The Wider Exploitation of Data Facilities

I would now like to invite you to consider some of the rather interesting ways in which you could use the new system.

There is no question in my mind but that speech communications will always be required, for obvious reasons. Speech and data communications are complementary, and data permits us to control the speech channels, a facility of great importance. Why should anyone with an urgent message to transmit to base await the completion of someone else's routine message? Surely the logical system is for the data channel to be used to provide speech facilities on a separate radio channel on demand, according to an agreed priority. In practice, the car operator would press a button marked 'SPEECH' whereupon the base processor receiving the message would allot say, Channel 2 to that vehicle, at the same time sending a data signal to the vehicle to automatically select the correct channel in the car. A second button could be used to indicate 'PRIORITY' and the base processor arranged to give precedence over routine traffic when this was used.

An undesirable but essential feature of our present systems is that all messages have to be transmitted in all directions since it is necessary to alert everyone else that the channel is in use. When the incoming channel is occupied, it is also necessary to transmit pip-tone to indicate that this is so.

If the allocation of speech channels to mobiles were strictly controlled as I previously outlined, the need for general dissemination disappears and all the energy could be concentrated in a particular direction, both incoming and outgoing, leading to a substantial gain in coverage and a considerable reduction in the likelihood of interception by unauthorised listeners. A useful degree of location determination might also be possible, perhaps adequate for normal deployment survey purposes.

A further intriguing possibility offers itself. In the event of say, a bank raid, why not let the system resolve the problem of minimizing the response time? An inertialess radio beam arrangement could be used to focus an arc to include the bank and any vehicles within a reasonable distance from it. The beam could be of adjustable width. In this way response would be virtually immediate, and any 'surplus' vehicles could be automatically returned to patrol as soon as an adequate number reported in by data giving their estimated time of arrival. This seems a more attractive and efficient possibility than the alternative of loading the operator with as much information as possible and leaving him to hurriedly digest this in order to determine the best course of action and which cars to deploy.

I would expect one facility to be particularly advantageous. Field officers would be able to communicate by speech, teleprint, or if necessary, facsimile copy with any of their colleagues at any extension in the police system. Indeed, there is no reason why this should not be extended to permit its use, if necessary, to any telephone terminal.

The Need for Cautious Assessment

The latter may be taken as an example of how a basically valuable facility may defeat itself if taken too far. Within the police network one would expect to limit such calls to those messages which are now laboriously written out and conveyed by pneumatic or other means, though to be realistic it should be assumed that they might double or treble because of the 'added value'. However, if extended to link with any telephone terminal the extra traffic might well submerge the radio system, and it is doubtful if more than a small proportion of the calls made from a mobile could not be made from a static terminal. My point is that the possibility must be explored and assessed from every point of view before being adopted or discarded.

The same applies to the interrogation of a local or the National Computer from a vehicular, or possibly a pocket installation which in due course could undoubtedly be done. We must proceed with extreme caution on this proposal because not only might it fail to provide the expected benefits but the value of the computer facility as planned might be jeopardized.

Conclusion

One American brochure lists the following data facility among many others: 'The ignition or other function of stolen police cars may be disabled by address message, as well as turning on the radio equipment or other indicators to aid in locating such cars.' I have not attempted to interest you in this and similar intriguing possibilities of perhaps doubtful value.

What I hope to have done is to convince you that if properly exploited and matched with new police procedures, mobile communication networks conveying data and speech are capable of being made far more cost-effective than the consideration of the basic facility alone would lead us to expect.

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