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Tactical Response Systems
Chairman: Roy Thomas

S E S S I O N 2

TACTICAL RESPONSE SYSTEMS

CHAIRMAN: ROY THOMAS

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ACQUISITIONS

POLICE TACTICAL RESPONSE

THE POLICE REQUIREMENT - PAPER No.1

Policing a modern society is a complex business which could occupy our minds over many days.

The style of policing to adopt, the numbers and varieties of response, the relative emphasis on preventive policing, reactive policing, control of public order and so on, provide topics both stimulating and challenging. But my task today is to isolate one of these topics; that of tactical response to calls for assistance so as to set the scene for our deliberations.

What do we mean by tactical response? We use this phrase to indicate the way in which a police force organises its resources to respond to calls for assistance on a minute-by-minute basis. It is distinguished from other organisational aspects of resource allocation by the short time scales involved.

It will be useful, in discussing the police operational requirement for tactical response systems in 1977, to look back in time and examine the foundations of policing in the United Kingdom.

A fundamental factor is the local character of police forces based as they are upon very ancient systems of parish constables. In the 19th century, first in the London Metropolitan area and subsequently in provincial boroughs and counties the spread of the "New Police" - organised, regular professional peace-keepers - brought a new sense of order throughout a land plagued as it was by upheavals in its social structure. It is important to remember this local autonomous nature of forces because it is the key to the independent development of our systems of policing.

However, patterns of policing established by the early metropolitan and borough forces were to have similarities based no doubt on that same desire to exchange ideas and information that has brought us here today.

If we look back we would find in those early forces a most significant feature, that of the individual patrolling officer as distinct from a group, squad, or platoon of men. And stress was placed upon the individual responsibility under the law of the police officer, he was not to be seen merely as a detached member of a squad taking orders from a superior, (although for practical reasons of command he might well have to do so), his authority was derived from a unique constitutional position - not a servant but serving the law and responsible to it for his actions.

The patrolling officer with his beat comprising a defined area of streets, alleys and passageways was posted with the belief that his presence would enable him to prevent breaches of the peace or offences and to discover those who had committed these acts. The size of the beat was so arranged that in urban areas he could visit all parts of it at least twice during his working day of 8 hours. The thinking officer and his supervisor would devise variations of route so that the factor of surprise might discover wrongdoers or deter others.

Of course this system has a number of attractions not least that it makes a more effective use of expensive manpower than static guards but it raises problems of communication, supervision and control.

One way in which these related problems was met was to have a fixed timetable of patrol so that the supervisor knew at appointed times where on his beat the officer would be - the keeping of points at telephone kiosks or police boxes followed on from this principle. Means of contacting patrolling officers by means of rattles, whistles, or the rapping of a cane on footpaths became normal means of attracting the attention of the patrolling officer as, in some American cities, did the raising of a type of semaphore arm or the flashing of street lamps as electric lighting systems spread.

Late in the 19th Century we find the spread of technology starting to affect the Police with the introduction of telegraphy, telephone and wireless. These forms of communication were to have a significant effect on the functions of the police and on the public expectations of them.

Organisationally the change in the timescale of communication from the written word to the speedy transmission of information by line made it possible to exercise much greater control of local station from a central headquarters, a feature which was of particular significance in county areas. (We shall see later the organisational impact that radio also was to have.)

But let us return to our patrolling officer. Before the spread of telephones the methods by which the public could contact him for assistance was by personal contract. The telephone changed this and led to the first of our tactical problems - i.e. having received a call into our police system how best to direct our patrolling officer to the point where his services were required, an allocation problem to be solved by communication.

The police developed their own telephone systems, some extensions being housed in boxes or pillars. By this means patrolling officers could contact their stations or be contacted at fixed times or points. If required between these points their attention could be attracted by a flashing blue lamp placed on the box or pillar. (Still a relatively crude method of communication in urgent need.)

The next major step forward was the introduction of motor vehicles. These were to speed up the response to calls for assistance but their use led to a second problem - how best to exercise control over these mobile resources. Wireless in cars was to provide the answer.

In parallel with the development of telephones, wireless systems were being developed. The first of operational police systems began in London in 1923 although experiments had been held in Detroit two years earlier. Initially morse code was used and, of course, this was to be superseded by speech.

The answer to the problem of controlling mobile resources lay in the new wireless communication schemes but the solution raised the question of how best to effect this control. In 1934 the first police information room was established in London. The room controlled the wireless vehicles which at that time numbered 50 during the day and 30 at night.

The next significant step was to be the introduction, in 1937, of the 999 system in London and with the spread of this system throughout the country came the growth of central control (or information) rooms at which emergency calls were received and from which vehicles, later to be equipped with VHF radio, were despatched. This was to remain as a basic system for some 30 years.

It will be useful at this stage to review developments. Typically a police force in the United Kingdom organised into divisions would have most of its patrol strength deployed on foot working traditional beats and keeping fixed points. Police boxes or pillars served as a means of attracting attention between these points. Superimposed on the patrolling foot constable would be a mobile traffic force, often organised as a separate division with its own command structure. These vehicles were equipped with VHF radio and were the first response to emergency calls received either centrally as in the large urban areas or more locally in counties.

Two features are significant, (a) most of the resources are not easily contacted, and (b) new control techniques have to be devised for mobile resources which can quickly be moved around the police area.

The next milestone in the development of command and control was the Unit Beat policing scheme. Organisationally it was based on a system of grouping together a number of residential officers and superimposing a small police car on each group. But, most importantly, it gave personal radio (UHF) to the patrolling officer and vastly increased the vehicle fleet. The decision to have UHF as the channel for personal radio schemes because of their short range local nature resulted in a two-tier communications system.

The first tier was the VHF system based upon a central control or information room and controlling, in the main, the road traffic cars or other support units such as dog patrols or CID.

The second tier, and by far the larger group of resources, used UHF personal radio and were locally controlled. (The emphasis on the local nature of control had a number of organisational effects which lie outside this central theme, e.g. the key role of the local controller.)

We now see a third problem - how to effect control in a situation where demands are received centrally via the 999 system and the response is to be locally despatched.

If this problem were not enough in itself the increasing use of telephones by the public, the increasing expectations of the public as to police response conditioned to an important degree by the impact of television programmes about the police, were to further complicate matters. Queuing problems were beginning to arise in message handling in Control rooms, and in the use of radio channels.

One of the worst features of this overloading was that the queue was moved from the Control room down the system to the patrolling officer which placed him under stress and which distorted priorities of response.

To summarise the problems facing the large urban forces in the late 1960's were:

- (a) A two-tier system of communication and resource allocation often with limited interaction which detracted from their effectiveness.
- (b) Increasingly loaded line and radio links as the public expectation of police response increased.
- (c) The effects of queuing problems being moved to the lower levels of the response system where priorities became distorted.

These problems involve control and the short extract from a film about the first of the UK Command and Control systems which you are about to see will underline this.

POLICE TACTICAL RESPONSE

THE ASSESSMENT OF THE PROBLEM - PAPER No.2

PART 1

Mr Broome has described how technology came to be used as an aid to policing and the problems facing forces in the late 1960's when the computer first arrived on the operational scene. I mention computers right at the start of my talk because to describe the development of tactical response systems in this country is to describe the way small and relatively cheap computers come to be used in control rooms.

I will make myself unpopular with my police colleagues by explaining that the initiative came in the first place from the Home Office. Because the educational background of police officers throughout the world is orientated more towards law and social subjects than it is towards science, I suggest that where state of the art technology is concerned, and there is a credibility obstacle to be overcome, the initiative will often have to come from Government level.

In 1968 the then UK and now EEC Roy Jenkins noted on his overseas visit, as Home Secretary, that computers were beginning to appear in police control rooms. He had noted no such tendency in the UK and asked why. The Home Office decided to run an experiment to find out if the police service should be encouraged to make more use of the then novel mini-computer. The City of Birmingham agreed to be the guinea-pig for the initial experiment and Mr Broome has already described the control problems then facing that force.

The situation the project team found on their arrival in Birmingham was:

- (a) force resources controlled on VHF radio from the central control room,
- (b) divisional resources controlled on UHF radio from divisional control rooms,
- (c) 999 calls arriving at the central control room,
- (d) responsibility delegated to divisional commanders for normal policing.

I must point out that in this country although we have a centralised 999 system 999 calls only constitute a small part of the total workload. Many calls for service are made direct to local police stations and in some forces this is encouraged as a means of emphasising the essentially local nature of the service given by the police to the community. This is no

doubt right from a community relations point of view but it does create problems for the designers of Tactical Response Systems.

The requirement stated by the then Deputy Chief Constable Mr Philip Knights (who is now Chief Constable of the West Midland force into which the Birmingham force has been amalgamated), was to design a system that would assist divisional commanders to run their own sub-units in their way, but would also make possible the full central control of all resources when this was necessary for operational reasons. The system had to be designed, therefore, to be as suitable for decentralised control as it was for full central control. The command concept was, and in fact still is, in that force to delegate responsibility for day-to-day policing to local commanders, so as to reap full benefit from local know-how without in any way impairing the capacity for full central control when for operational reasons this is considered unavoidable.

The project team decided that the main requirements were to introduce:

- (a) high speed communication links between all concerned with the receipt of calls from the public and the subsequent despatch of police resources,
- (b) a formal method of recording incidents that would speed up the clerical process,
- (c) improved resource availability displays.

My use of the word RESOURCE instead of vehicles means that we were no longer concerned with cars but also with resources such as motorcycles, dog vans and with that much more numerous resource - the policemen on foot patrol. These facilities were provided by the system of a single processor and nineteen VDUs that went live in Birmingham in 1972. That experimental system is still running in Birmingham where it deals with up to 1000 calls a day. It is being replaced next year by a system which although much larger still retains the original design concepts of high speed communications by VDU, a formalised instant handling procedure and sound resource availability facilities.

The Birmingham prototype played two important roles:

- (a) in spite of its limitations it persuaded police officers that the computer was a tool that had attributes that should in the future be fully exploited,
- (b) it had the potential to make available facts and figures about uniform policing that could transform police supervisors into effective managers.

This is an aspect that will be considered in Session 4 tomorrow.

However, we soon ran into difficulties in Birmingham. We scientists saw as our role the further development of the system as feedback from the police user was received, but anything but minor enhancements of a system using a single processor means that you have to withdraw the system from use by the control room in order to modify it. This the police did not like and it was finally decided to leave the Birmingham system as a prototype only and to switch development to Glasgow where a system of two computers was to be introduced. With two processors development work could be carried out without interfering with operational utilisation. It is interesting that it is the requirement for development facilities rather than reliability that is the main reason for the trend in the UK to swing from single to twin processor installations.

Fortunately we have a short film showing the Glasgow system in operation which I will be showing you but, first, a few facts. The switch from Birmingham to Glasgow allowed us to use the larger VDUs and the higher line speeds that were then becoming available and to update our work in many other technical details but it also allowed us to introduce three major additional facilities:

- (a) Cartographic Display
- (b) Message Switching
- (c) Crime Reporting

You will see the cartographic displays in use in the film so all I must explain is the background. We feel that one of the weakest links in our response systems is the presentation and utilisation of location information. How accurate location information needs to be is very much a matter for debate especially in the UK. We do not use a "Fire Brigade" system but instead allot cars by beats or areas. But some location information is essential and the Rear Port VDUs installed in Glasgow are part of a research project to find out what the real requirement is.

Regarding message switching, I must explain that most forces in this country have for many years had extensive teleprinter networks using manual input. We found in our development work that there was a requirement to pass information held in the computer to stations that did not have VDUs but did have teleprinters. A manual interface as was installed in Birmingham was electrically possible but tedious to use. The real requirement was to fully integrate the VDU and teleprinter system so that with the extended network any station that had either a VDU or a teleprinter could have full use of the system. This is the main reason we introduced message switching in Glasgow.

The crime reporting system introduced was the first application of the integrated communication concept and was only possible because teleprinters had become an integrated

part of the computer system. When crime reports are first made out in Glasgow the teleprinter is used instead of a typewriter with the result that essential crime information is made available for processing as soon as it is formally recorded. The daily and routine reports that previously had required much manpower to produce are now in Glasgow produced automatically by the crime reporting module.

I would now like to take a break by showing you the Glasgow film and then bring you up-to-date with what has happened since.

PART 2

That, Gentlemen, was the Glasgow system that first went live in 1975 to cover the City of Glasgow only and currently is being extended to cover the whole of the Strathclyde area - about half of Scotland.

To continue the story up to the present day I would like to describe the modular fashion in which tactical response systems are now evolving:

- (a) We started in Birmingham with a resource availability system and an incident handling system linked together by a VDU communication system. The teleprinter network which every UK force already has remains separate.
- (b) In order to make resource information available when required and in order to move incident data from the centre to the local station even if only to keep the local station in the picture, it was necessary for this incident and resource data to be stored and processed. It was, therefore, available for analysis. Police officers found that they could through the computer get ready access to information that was useful both for day-to-day decisions as well as for longer term planning. The first British police management information system using an on-line computer was born and has been steadily developed ever since. You will be hearing details of this in Session 4 tomorrow.
- (c) This is the present Birmingham and was the starting point of Glasgow. There is a basic defect in that there is no sufficiently fast way of getting hard copy - information on paper as opposed to information on the screen - to divisional and local stations where operational decisions are also made. The solution to bring together the fast VDU and the slower teleprinter networks into an integrated data system - was one of the priority enhancements introduced into Glasgow.
- (d) Once we had computer access to the teleprinter system we could use it for other purposes than just message switching. The first example of this was the crime information module that I have already spoken about and I know that other applications of this teleprinter network (now that it is connected to the computer) are also under consideration.
- (e) Policing is manpower intensive and information intensive. The tactical response systems initiated since Glasgow have accepted incident handling and

integrated data communications as starting points and have forged ahead developing modules to alleviate their manpower and information distribution problems. My time only allows for a few examples.

- (f) So far I have only been talking about large urban forces but these even in overcrowded England are in a minority. The majority of forces police an area that is a mixture of countryside and of small to medium size towns and we generally refer to forces of this type as county type forces. Staffordshire is a typical county type force situated immediately North of Birmingham. The Staffordshire force decided that they had a major problem in their manpower planning and they are developing a Duty State Module to enhance their basic tactical response system.
- (g) The planning effort required to ensure that there are enough men on duty at all times to give the predetermined level of ground cover is great bearing in mind the requirements that men if they are to stay police officers must be asked to work reasonable hours and there must at all times be an adequate reserve. Can the attributes of the computer be used to assist in this planning? We will find out in Staffordshire.
- (h) Suffolk is a county type force situated on the East coast. Moving into a new headquarters the Chief Constable decided to introduce a computerised tactical response system and considered what additional modules should be included. Their feasibility study revealed an information distribution problem. Although the force had its own local record office there were considerable problems in making the information held in these local records available to operational police officers as and when required. Vehicle ABC123 clean as far as the Police National Computer is concerned is noted in suspicious circumstances. Has it been noted in the docks area after midnight on other occasions? The Suffolk force has introduced an information retrieval module to enable patrolling police officers to find out operational information of this type immediately.
- (i) One force that has been exceptionally forward in introducing technology is the Dorset force. They introduced data devices into their police cars many years before the Home Office programme was started. Their new tactical response system shortly to become operational has followed a rather different course from the ones I have outlined so far. It is less concerned with immediate operations and has a more comprehensive management information system closely integrated with the local authority computer organisation. Again, you will be hearing more about this in Session 4 tomorrow.

- (j) An important computer facility that you will have noted from the Glasgow film is the capability of joining the small force computer to a large data base processor. The effectiveness of a link from a force computer to the Police National Computer was proved in an experiment we ran a couple of years ago. As a direct result of the computer-to-computer link the utilisation by the force of PNC facilities jumped by 22%.
- (k) Those are a few of the examples of the way in which police forces are exploiting the enhanced communication and the enhanced information processing facilities given by a computerised tactical response system. A system with all modules developed so far connected to it would look something like this.

I am not suggesting that every Tactical Response System should include every module. The procedure we use is to persuade forces to examine very carefully their organisational structure and their internal statistics in order to see where their real problems lie. Only when these have been identified should the Operational Requirement be finalised and the procurement exercise begin. I and my colleagues will be very pleased to discuss the procedural side in detail with you if you would like us to do so.

From a start of one experimental police system in 1972 a further seven forces have now placed contracts for more advanced systems and at least as many again have study teams examining their requirements. That this very rapid rate of growth has occurred at a time of severe financial restraint has persuaded us that there are in the UK computerised Tactical Response Systems, facilities for which police forces of all types have genuine operational needs.

Thank you, gentlemen, for the opportunity to tell you about what we consider to be a success story and we welcome the opportunities that will occur during the symposium to discuss your ideas with you.

POLICE TACTICAL RESPONSE

THE INDUSTRIAL VIEW - PAPER No.3

Tactical response systems are systems used by a Police force to assist in the minute-by-minute incident and crime responses. Essential components for tactical response system are an efficient communications system and a command structure which allows fast deployment of resources in response to calls for assistance, without jeopardising requirements for preventive policing and area coverage.

As a result of the UK work which was mentioned by Mr Burrows, we are well versed in the fact that all these systems are different, even in a country where Police methods are similar between forces. The differences mentioned at this point are not just the cosmetic differences but those conditioned by the different problems facing forces such as the high crime and violence rates in Glasgow to the problems peculiar to rural policing in Staffordshire, where the addition of a major motorway also causes special problems. When one looks at Police forces overseas one must also recognise where countries split Police functions between two, three or even more organisations within one area. In all these situations it has been shown that computer based Command and Control systems can be of assistance. The main objects of computer based command and control can be summed up by saying that it is designed to assist in the best use of available manpower. In order to do this two major objectives are tackled.

Firstly, the system is designed to ensure the fastest attendance at urgent and important incidents of the correct resource for that type of incident. This should preferably be, as in Glasgow, without the worry of artificial police division or precinct boundaries increasing response times. Secondly, is the provision of the correct type of management information to appropriate levels of management as perhaps most strongly expressed in Dorset. This is discussed in detail in a later paper but it is important to recognise now that management information cannot be effective without effective data collection preferably in real time (i.e. as it happens).

It will be seen from what has been said already that no commercial company can design and install a command and control system which will be the most effective without the total co-operation of the Police force concerned. The success of the UK command and control systems as some of the foremost in the world has only been possible by the contractors receiving every assistance possible from the police during the design stage of the project. This assistance has been provided via working parties and consultations where the experts in any field have been in direct consultation with the company. Two examples of this, taken from the Glasgow project, illustrate the point. In control room procedure the

officer in charge of the control was joined in discussion with actual working controllers with detailed knowledge of their problems. In the case of crime reporting CID officers were consulted to determine both what was practical and what was required.

It will be obvious from this that consultation with the lower ranks who will operate the system also generates a willingness to co-operate later in getting the best out of the system when it goes live. Previous experience has shown that where this does not occur there is a danger that rejection of the system by the operators will cause haphazard entry of data resulting in misleading management information.

British industry over a period of many years has co-operated with police forces and the Police Scientific Development Branch of the Home Office in projects aimed at identifying and developing police requirements for tactical management systems. The companies involved thus have a sound understanding of Police problems and the ability to assist the police in formulating solutions to these problems. The keynote is flexibility of approach and total involvement with the police force in the early stages of design and specification. In UK industry whilst retaining the ability to offer a standard system we would normally expect to tailor designs to individual police requirements.

When one first considers the design of a command and control system it is important to know whether or not it is expected to be fixed at a given size both in numbers of terminals and workload or whether these, and probably the numbers of applications, are to increase. If changes are likely it is a false economy to buy slightly cheaper systems incapable of expansion than to buy a basic but expansible system. In looking at this future and overall design it is important to consider the distribution, if any, of the processing power. In the Strathclyde system three computers are in use serving the major and minor controls throughout the region. These computers are all co-located in the one suite of the headquarters in Glasgow. In the case of the West Yorkshire Metropolitan Police plans were originally based on using a number of computers at different locations throughout the Police area, and installing these over an eight year programme. This plan was flexible enough that the revision of the police force command structure has not affected other system design other than to make it likely that again the computers will eventually be re-located.

Yet another configuration is in Dorset where the two command and control computers act as front end computers to a local government computer which provided the management information. The whole key is flexibility of approach and modularity of software and hardware as in all UK systems.

Another important aspect to be considered at the time of designing a system is the degree of reliability or availability which is acceptable and also the amount which

can be spared to ensure that data and service are not lost wherever possible. It has become fashionable to consider duplication of systems wherever possible but this is expensive and note should be taken of the fact, often not appreciated in non-technical circles, that modern computer hardware can often be configured into a design where, although complete duplication safeguard is not present, easy re-configuration is possible in the most vulnerable areas and also where data to provide the security of data required. The question which must be asked by Police forces buying a system is what time "off the air" can be tolerated. It has been found in practice in UK police systems that an infrequent down time of two or three hours can be tolerated although it is obviously unpopular. (It should be noted that all the systems considered have duplicated data storage as a safeguard.)

It is now essential to answer the question "Why a dedicated system for command and control and allied applications?". Where a system has to operate at high speed, with very high integrity, high work load (all at high priorities) twentyfour hours a day every day of the year it is necessary to have certain situations not normally found in data processing installations, for example:

- (a) The system software is debugged to the highest possible level as an integrated system including all subsidiary programs. These are not treated as stand-alone programs as in data processing although the modular programs are transferred between systems.
- (b) The hardware used is that designed for process control work where it is not normal to take the full system down for regular maintenance. Many data processing systems have weekly periods of down time for routine maintenance and are not as robust as process control equipment.
- (c) Many data processing systems, whilst aware of the problems of data security, are susceptible to interference which should not be possible with dedicated processors on secure police premises, operated by police employed personnel.
- (d) In a dedicated system it is normally far easier to ensure a software organiser which schedules the status and priority of programs in such a way that the operators can always be sure of the best response times possible when dealing with emergency facilities.
- (e) In general the hardware configuration of data processing systems is less flexible than a dedicated process control based system where the system configuration is designed solely for that customer from flexible modules.

- (f) Training facilities must be provided which do not interfere with normal operation. Although present in all UK systems this point has been particularly highlighted in Dorset.

In this paper it would not be reasonable to attempt to describe the many facilities available on existing or proposed systems. This can best be done in discussion with manufacturers on their stands (for example: Strathclyde has around 40 and Stafford 50 different facilities). It must, however, be pointed out that the handling of incident logs, which most people associate with command and control, is only one application of the system and that such things as telegraph message switching, crime reporting, personnel duty state and management information are quite normal.

Some systems in hand, in some UK police forces, also include limited criminal intelligence and allied files.

The projects already undertaken have resulted in an approach methodology for designing new police systems. Immediately available are software packages built in a modular form which will support extensive terminal networks and provide links to other computer systems if required.

All applications may not be required initially but could be easily integrated after the system is operational. Additional hardware products, e.g. microprocessor-driven data collection equipment, special displays for resource levels and utilisations are also available. The systems have been developed on well-tried computers which can be supported world-wide. A total turnkey systems package is available either in a "standard" or tailored form, providing to the end-user proven performance and support, together with full training for the customers' own programmers, operators and users.

It is relevant to refer to work carried out by an independent financial expert used by the Home Office Police Scientific Development Branch to study the Birmingham experiment in command and control. Although cost benefit analysis of this work is very difficult it was concluded that there was no doubt at all of the high level of cost saving introduced by the system. This report is enhanced by the fact that the Glasgow control room now handles around 1400 incidents per day compared with much less than half that number in the old manual control room but without any increase in staff. This would have been impossible under the old manual system which was near to saturation.

Another important parameter in Glasgow is that their normal response time has been cut by about two minutes since the introduction of the new system. This must surely be one of the most telling points in favour of a system of the type discussed.

What of the future? All the systems so far installed or planned are flexible and are being updated as knowledge of both police requirements and technology increase. One area which should be highlighted as an accepted future requirement is automatic vehicle location. At present no systems in the

world have been proven at an acceptable cost for general fit in all police cars. However, these systems are actively being developed in the UK and can be discussed with manufacturers in the Exhibition. It is felt by those manufacturers that the most promising solution at present is based on a technique involving the vehicle knowing where it is on a basis of turn plotted against distance travelled. It is further suggested by one manufacturer that this system would allow better than 50% vehicle utilisation and at that level the benefits will exceed the AVL system cost over a seven year amortisation period.

This is only one future development and the various manufacturers of systems are obviously well aware of market trends in technological improvement. You will remember the major advances outlined by Mr Burrows in systems installed even as close together as 1972 and 1974. These improvements are, however, worthless unless properly applied by companies knowing the problems faced in operations by the police.

The manufacturers will be pleased to discuss with you the latest developments which are relevant on their stands in the Exhibition area.

We feel that British Industry takes the trouble to find and discuss these problems with the police and has certainly proved itself capable of applying the latest technology to them.

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