SUMMARY

The fingerprint service is a small but important part of the work of the police. It accounts for only 0.7 per cent of police expenditure, but offers a unique system of crime detection because it can identify to the police the individual responsible for an offence, as well as often providing sufficient evidence to secure a conviction. This Police Paper is therefore focused on issues of effectiveness rather than economy.

The fingerprint services of most provincial police forces in England and Wales are achieving significantly below their potential in terms of the number of identifications obtained from fingermarks left at scenes of crime. In 1987, these forces recorded over two million crimes of the type at which fingermarks might be left, such as burglary and motor vehicle theft, but in only 40,000 of these cases were the offenders identified using fingerprints (Exhibit 1).

This situation arises for two reasons.

Firstly, in many forces existing resources are not being used to maximum effect. The variation in performance between fingerprint bureaux is very wide—for example, some bureaux obtain six times as many identifications per fingerprint officer as others. In addition, there is a serious imbalance between the resources applied to collect marks from scenes and those applied to compare the marks collected against fingerprint

Exhibit 1

RELEVANT OFFENCES AND FINGERPRINT IDENTIFICATIONS

The full potential of the fingerprint service to solve crimes is not being realised...
collections. Overall, capacity to collect marks significantly outstrips ability to search them thoroughly, possibly by a factor of four to one.

Secondly, in the majority of forces the fingerprint service is underresourced. Of the two million crimes referred to above, one in three were examined for fingermarks, while in some forces less than 10 per cent of the marks submitted are searched.

The practical implication is that a large number of offenders who could be identified by the fingerprint service are not apprehended and may well, of course, go on to commit further crimes. By improving efficiency and enhancing resources, the fingerprint service should be able to achieve two and a half times its existing number of identifications, an extra 60,000 identifications a year. The Commission estimates that roughly one third of this increase can be achieved through efficiency improvements, but the balance would require the addition of extra resources.

In the medium to long term the fingerprint service may be revolutionised by the introduction of new technology providing a high speed, computerised automatic fingerprint recognition and retrieval system. There is, however, much that can be done to improve the organisation and management of the service in the interim.

It is important to recognise that work in the fingerprint service can be monotonous and is often poorly paid. This can give rise to problems with morale that affect personal motivation. In some forces, those working for the fingerprint service feel alienated from the remainder of the police force. Unless this issue is addressed, there is little prospect of a significant improvement in performance.

This Police Paper examines the performance of force and regional bureaux and the management of scenes of crime and fingerprint officers. A diagnostic model for evaluating the effectiveness of each force's service is described. A series of practical suggestions for improving the management of the service and increasing its effectiveness in detecting crime is set out. Finally, the role of new technology is considered.

INTRODUCTION

1 Fingerprinting is one of the most powerful tools available to the police in its fight against crime. It offers a unique system of crime detection because it can identify the offender, as well as often providing sufficient evidence to secure a conviction.

2 Two quite distinct facilities are involved. Firstly, confirmation of the identity of arrested persons is undertaken centrally by the National Identification Bureau (NIB) in London. Secondly, the retrieval and examination of fingermarks recovered from scenes of crime is the responsibility of individual police forces.

3 The service's main function at local level is to retrieve fingermarks from crime scenes and compare them with fingerprint collections held by regional and/or force bureaux in order to identify offenders. This Police Paper reviews the operation of the service in provincial forces in England and Wales. It specifically excludes consideration of the two London forces because the Commission has no remit in these organisations. Nor does the paper consider recent advances in the field of DNA profiling, which relies on an analysis of cell structure but is sometimes referred to, rather misleadingly, as 'genetic fingerprinting'.

4 There are those who argue that, in view of the possibilities offered by DNA profiling, fingerprinting may soon become an outmoded technique. But this is unlikely to be the case in the medium term. Police powers to take the samples necessary for DNA profiling are currently more limited than their powers to take fingerprints. A change in the law would be required to put the two techniques on a par. Further, the fingerprints of some four million offenders are held on file at the NIB, though the total number of fingerprints held by all forces in the UK is significantly higher. Before a comparable library of genetic information could be built up, it would be necessary for each person whose fingerprints are currently on file to re-offend (and be caught) so that samples could be taken. It is impossible to tell how long this would take.

"...fingerprinting is one of the most powerful tools available to the police in its fight against crime..."

5 There are 33 fingerprint bureaux serving the 41 provincial police forces in England and Wales. They employ 460 police officers and civilians. A further 980 staff are employed by forces to collect forensic and fingerprint evidence from scenes of crime. No accurate figures are available but total direct expenditure on the fingerprint service in 1987 was probably around £16 million—less than 0.7 per cent of total police expenditure.
There is no information available nationally on the number of crime scenes at which fingermarks could conceivably be left. On the basis of the reported crime figures, the Commission estimates that there are probably over two million crimes a year of the type at which fingermarks might be deposited, e.g. burglaries, motor vehicle thefts etc. In addition, there are some 100,000 crimes involving documents from which fingermarks might be recoverable. A total of 687,000 of those two million crime scenes were visited by scenes of crime officers last year, i.e. roughly one in three. The actual proportion of relevant scenes visited varies significantly between forces, however, ranging from 19 per cent to 53 per cent in extreme cases. Fingermarks were found at a quarter of the scenes visited. In 29,000 cases criminals were subsequently identified (Exhibit 2). Another 11,000 identifications were made by examining documents such as stolen cheques. Furthermore, surveys conducted by the Home Office have shown that, for every identification, admissions by offenders lead to between 2.5 and 10 further cases being solved.

The Commission considers, however, that the potential of fingerprints in detecting crime is much greater than this. The 40,000 identifications achieved last year represent less than 1.9 per cent of relevant offences. In many cases, of course, the offender will have left no mark, but the proportion of crimes where identification might be made using fingermarks is certainly greater than the 1.9 per cent achieved. The fact that only 26 per cent of the scene of crime marks available for check and search are ultimately identified is particularly surprising since over 70 per cent of all offenders who are detected, by whatever means, already have their fingerprints on record.

There is considerable scope for improving the performance of the fingerprint service by increasing efficiency. There is also strong evidence to suggest that in many forces the service is under-resourced.
THE FINGERPRINT SERVICE

THE RESOURCES

9 The service employs two main types of officer:

Scenes of crime officers (SOCOs) attend scenes to find fingermarks. While there they often take prints of persons with legitimate access to the scene in order to eliminate any of their marks which may be collected. These prints are subsequently destroyed. They also collect photographic and other forensic evidence but this does not form part of the fingerprint service. A recent Home Office report* states that typically a SOCO will spend 60 per cent of his time on fingerprint work.

10 The average cost of each identification obtained using fingerprints is about £400—rather less than a week’s detective work. This includes the cost of both the fingerprint officers and that part of the SOCOs’ time spent on fingerprint work.

THE ORGANISATION

11 There are 33 fingerprint bureaux serving the 41 provincial forces in England and Wales. Six regional bureaux serve 21 forces of which seven also have their own force bureau. The other 20 forces have their own bureau and do not use the regional bureaux (Exhibit 3).

12 It is important to note that regional bureaux normally only compare marks received from a force with the collection of prints from that force. Other than in exceptional cases they do not perform wider searches; the service they provide is therefore directly comparable with that of force bureaux.

'...considerable scope for improving the performance of the fingerprint service by increasing efficiency...'

13 Since 1974 there has been a steady drift away from regional bureaux and the number of force bureaux has approximately doubled. Behind this trend lies the assumption that most crimes are committed by local offenders and a belief amongst forces that their own bureau will have several advantages over a regional bureau.

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*The Fingerprint Service in the UK; pointers for improving organisation and management 1986.

Exhibit 3

ORGANISATION OF THE FINGERPRINT SERVICE

Some forces have their own fingerprint bureau, others use a regional bureau, while seven forces use both.

**Forces using regional bureaux**

Northumbria  Durham  Cleveland
Cumbria  North Yorkshire  West Yorkshire
Staffordshire  Northamptonshire  West Midlands
Dyfed-Powys  Gwent  South Wales
Avon and Somerset

**Forces with own bureau**

Greater Manchester
Cheshire
Merseyside
North Wales
Humberside
South Yorkshire
Derbyshire
Nottinghamshire
Lincolnshire
Norfolk
Suffolk
Cambridgeshire
Essex
Bedfordshire
Hertfordshire
Surrey
Thames Valley
Kent
Sussex
Hampshire
In particular:
— it will allow greater control over the way marks are searched;
— it will search marks more promptly;
— there is no risk that the force's work will be given a lower priority than that of the force hosting the regional bureau.

14 There is no evidence that there are economies of scale to be gained in large fingerprint bureaux. There is also no clear evidence that regional bureaux are more or less efficient than force bureaux—the average number of scene of crime identifications per fingerprint officer is 55.4 for regional bureaux and 51.9 for force bureaux. Nor are regional bureaux more or less effective—the proportion of identifications per notifiable offence is 1.3 per cent for regional bureaux and 1.2 per cent for force bureaux. There can be, however, a wide variation in the value for money individual forces obtain from the regional bureaux (Exhibit 4).

THE PROCESSES

15 Exhibit 5 overleaf shows how a fingerprint would be processed in a typical bureau. There are four main types of fingerprint pattern; the main characteristics are ridge endings and forks (Exhibit 6).

16 To achieve an identification, there must be no discrepancy between individual characteristics in a mark recovered from a scene of crime and the fingerprints of the alleged offender. For an identification to be presented in court, at least 16 recognisable features of a single digit mark found at the scene must correspond with 16 features in the print; for multiple digit marks, fewer features per digit are acceptable.

Most professionals regard correspondence between ten, or even in some cases eight, features as adequate to establish identity and, although this would not be presented in court, it is used in practice to focus investigation on a particular suspect. In this Police Paper the term 'identification' means that the evidence would be presented in court.

VARIATION IN PERFORMANCE

18 The first indication that there is scope to increase the effectiveness of the fingerprint service in helping to solve crimes is the wide variation in performance between forces as shown in Exhibit 8.

THE POTENTIAL

17 There are three main reasons for believing that there is potential to increase the contribution of the fingerprint service to crime detection:

• there are wide variations in performance between individual forces;
• there are wide variations between individual forces in the level of resources and in the proportions of resources allocated to recovering marks from scenes as against searching those marks in bureaux;
• limited use is made of technology.

Exhibit 7 summarises the size of the potential benefit to be gained from improving performance and increasing resources.
Exhibit 5

PROCESSING A MARK FOUND AT A SCENE OF CRIME

Most fingerprint bureaux process marks similarly...

Notes
Data relate to one force visited
* 52% of these marks were of searchable quality, but had not been searched because elimination prints had not been obtained.
19 If the performance of all forces in terms of the number of identifications achieved per 100,000 notifiable offences could be raised to that already being obtained by the best quarter of forces then the number of identifications would increase by over 50 per cent. Raising performance to that of the best tenth of forces would almost double the existing number of identifications.

VOLUME AND BALANCE OF RESOURCES

20 In general, the fingerprint service is under-resourced. Assuming no improvement in efficiency, increasing the total number of SOCOs and fingerprint officers to 75 per 100,000 notifiable offences, i.e. the highest level of staffing currently existing in any force, should result in some 63,000 identifications being achieved per annum, an increase of a little over 50 per cent on the existing level. Increasing resources to this level would not incur any diminishing marginal returns (see statistical footnote to Exhibit 13).

21 There is also a serious imbalance between the resources being deployed to collect marks from crime scenes and those used to search the marks. In some forces less than 10 per cent of marks submitted are searched. In one force visited there was a four year backlog of arrested persons' prints waiting to be classified and filed—its fingerprint collection is virtually useless. In another force there were 400 searchable marks dated prior to 1986 which had not been searched as at December 1987.

USE OF TECHNOLOGY

22 New technology also has an important part to play. The Home Office is evaluating an automatic fingerprint recognition system (AFR). This would scan marks, compare them with images of prints stored digitally and identify possible matches. However, it is not certain when, or even if, a fully operational system will be available. Other countries, too, are active in this field. Work is currently going on in North America, the Far East and in Europe to develop a fully automated system but, as yet, none of the systems commercially available offer a clear breakthrough. In the longer term, then, computerisation may transform the fingerprint service in the UK, but it would be wrong for forces to wait for a new system when improvements in existing techniques are available now.

23 For the next few years at least, therefore, forces must concentrate on improving management and procedures and so exploit more fully the crime solving potential of the fingerprint service. This will have the added advantage that it will leave forces well-placed to derive maximum benefit from advanced technology when, and if, it becomes generally available. In the interim, existing technology may also be useful; this is discussed later.
ASSESSING PERFORMANCE

24 In order to identify what should be done to improve performance in a particular force, it is necessary to pinpoint areas of under-performance. To do this, a systematic method of analysing performance is required.

25 The Commission has developed a 'diagnostic model' which evaluates a force's fingerprint service against nationally derived performance indicators and identifies opportunities for improvement. The model can be used in a number of other ways—to compare, for example, the performance of individual divisions within a force against that for the force as a whole. This should not be regarded as a 'once and for all' exercise, but should be repeated at least annually as a means of reviewing performance and progress. The Commission suggests, therefore, that the model should form the basic source of management information for the force's fingerprint service.

'...serious imbalance between the resources being deployed to collect marks and those used to search the marks...'

26 Exhibit 9 lists some of the indicators in the model, and a schematic outline is given in the appendix. The model will be described in detail in the forthcoming Audit Guide, available in early 1989. It will be calibrated at force level by bringing together statistics collected by the National Conference.

Note
This chart includes data for 19 forces relying exclusively on their own in-house bureaux and for six regional bureaux. Figures for the regional bureaux have been determined by aggregating those for their constituent forces since it is not always possible to identify accurately the resources allocated to an individual force. Consequently this chart understates the true degree of variation.

Source: Audit Commission analysis of data obtained from the National Conference of Fingerprint Experts, 1987
of Fingerprint Experts and crime statistics submitted by forces to the Home Office. The sub-branches of the tree will consist of performance indicators at a number of different levels of detail. The indicators are linked by mathematical and logical relationships. The model will be completed by local auditors as part of the 1988-89 audits and will provide a thorough evaluation of all the main aspects of the force’s fingerprint service.

27 It should be noted that those indicators which are expressed as numbers per fingerprint officer will be of no relevance to forces using regional bureaux. Their main interest will be the cost of each identification made by the regional bureau and how this would compare with the cost of establishing a bureau in-house. This is another factor that will be considered as part of the 1988-89 audits.

28 Forces with their own bureau which also use a regional facility should compare the cost per identification of the two. The cost of the force bureau in one force visited equated to £50 per search or £104 per identification, the corresponding costs of its contribution to the regional bureau were £151 and £845.

29 Having identified opportunities for improvement, it is likely that these opportunities can be realised by one or all of the following:

• improving the basic performance of the service;
• increasing the resources available to it;
• investing in new technology.

The remainder of this Police Paper discusses each in turn.

Exhibit 9
FINGERPRINT DIAGNOSTIC MODEL – KEY INDICATORS
The Commission has developed a diagnostic model …

Activity

Examples of key indicators

Work of Fingerprint Service

<table>
<thead>
<tr>
<th>Activity</th>
<th>Examples of key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offences resulting in identifications</td>
<td>Total persons identified</td>
</tr>
<tr>
<td>All relevant offences</td>
<td></td>
</tr>
</tbody>
</table>

Work of Scenes of Crime Officers

<table>
<thead>
<tr>
<th>Activity</th>
<th>Examples of key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit crime scenes</td>
<td>Scenes visited</td>
</tr>
<tr>
<td>Relevant offences</td>
<td>No. of SCOCs</td>
</tr>
</tbody>
</table>

Obtain marks

<table>
<thead>
<tr>
<th>Activity</th>
<th>Examples of key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases with marks</td>
<td>Relevant offences</td>
</tr>
<tr>
<td>No. of SCOCs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Examples of key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases with marks</td>
<td>Persons identified</td>
</tr>
<tr>
<td>Scenes visited</td>
<td>No. of SCOCs</td>
</tr>
</tbody>
</table>

Work of Fingerprint Officers

<table>
<thead>
<tr>
<th>Activity</th>
<th>Examples of key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliminate/reject marks</td>
<td>Percentage of scenes marked</td>
</tr>
<tr>
<td>- eliminated</td>
<td>- rejected</td>
</tr>
<tr>
<td>- filed, no further action</td>
<td>- filed, suspect only</td>
</tr>
<tr>
<td>- suspect only</td>
<td>Cases after elim/reject</td>
</tr>
<tr>
<td>Relevant offences</td>
<td>No. of SCOCs</td>
</tr>
</tbody>
</table>

Compare marks against named suspects

<table>
<thead>
<tr>
<th>Activity</th>
<th>Examples of key indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make mark to print identifications</td>
<td>Suspect ids</td>
</tr>
<tr>
<td>No. of FOs</td>
<td></td>
</tr>
<tr>
<td>Cases searched</td>
<td></td>
</tr>
<tr>
<td>No. of FOs</td>
<td></td>
</tr>
</tbody>
</table>

Note
This outline shows only a selection of the 49 indicators defined in the model and, in particular, the work of fingerprint officers on documents and mark to mark searches is not shown.
**IMPROVING PERFORMANCE**

30 There are three basic stages in the fingerprint process:

- maintaining the collection of fingerprints of persons convicted or cautioned for a notifiable offence;
- obtaining the marks left at the scene of crime;
- making the match between the mark found at the scene and the print in the collection.

This section looks at each of these stages in turn and sets out a number of practical suggestions for improving the service. For ease of reference, the recommendations contained in this section are summarised in Exhibit 10. The section concludes with some general observations on staff management.

**MAINTAINING THE COLLECTION**

31 The first key element of a successful fingerprint service is the collection of prints. The bureau must keep an up-to-date set of good quality prints of all persons convicted or cautioned.

**COLLECTING THE PRINTS**

32 The Police and Criminal Evidence Act 1984 (PACE) sets out the powers of the police to take the fingerprints of persons without their consent. Broadly, they can do this if the person has been charged with, or will be prosecuted in respect of, a notifiable offence, or if he or she is held in custody and there are reasonable grounds for believing the prints will prove or disprove involvement in the crime for which he or she is detained.

33 Alternatively, prints may be taken with a person's consent. In the case of persons below the age of 14 the parent or guardian must give their consent. For 14 to 16 year olds the permission either of the person involved or the parent or guardian is acceptable.

34 The Commission considers that forces should seek to obtain as comprehensive a collection of fingerprints of known criminals as possible. For that reason Force General Orders should reflect the powers granted by PACE and officers should always seek to obtain the fingerprints of offenders, even where it is necessary first to obtain consent.

35 Fingerprinting juveniles is particularly important because they are comparatively active in crime— for example, over a three year period, 30 per cent of people arrested by a major force for breaking-in offences were under 17. There appears, however, to be a reluctance to fingerprint juveniles—in the same period only three per cent of fingerprints taken from persons committing such offences in this force related to persons under 17.

**QUALITY CONTROL**

36 Prints must be of good quality for two reasons—not only can poorly-taken prints be unusable for searching but also fingerprint officers work far more quickly when examining good quality prints. None of the forces visited operate a formal quality control procedure to identify the source of poor prints. An overall measure of the quality of a force's prints is the proportion rejected by the National Identification Bureau—this averaged 2.3 per cent in 1987 and varied from 1.6 per cent in one force to 3.6 per cent in another. Designating certain officers to specialise in taking fingerprints is an obvious way of improving quality.

'...one force visited was four years in arrears in classifying and filing new prints,...'

**GOOD HOUSEKEEPING**

37 Once the prints have been obtained, they should be classified and added to the collection within a few days. It has already been noted that one force visited was four years in arrears in classifying and filing new prints, rendering its search collection virtually useless.

38 The process of removing from search collections those prints which are no longer required because, for example, the person has not re-offended for several years, is known as weeding. Forces' weeding policies vary considerably. One force visited does no weeding; another weeds out annually all persons known not to have re-offended for seven years. If collections are not weeded, they become unnecessarily cumbersome to search. One force reduced its collection by over 30 per cent following an aggressive weeding policy. Forces should, therefore, reconsider their weeding policies.

**ORGANISING THE SEARCH COLLECTION**

39 The search collection should be organised in such a way as to enable the fingerprint officer gradually to extend the scope of the search, comparing the mark with the most likely prints first. Because new technology may be on the horizon, large scale reorganisation of collections may...
### OPPORTUNITIES FOR IMPROVING PERFORMANCE

<table>
<thead>
<tr>
<th>Review area</th>
<th>Indicator</th>
<th>Remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAINTAINING THE COLLECTION</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Collecting prints                  | Number of prints as percentage of number of persons charged or cautioned   | i) Review force orders  
ii) Test for compliance with force orders by comparing custody records and caution books with fingerprint records |
| Quality control                    | NIB reject rate                                                           | i) Develop adequate management information to identify source of unsatisfactory prints  
ii) Identify officers in need of additional training  
iii) Limit taking of fingerprints to specialist officers |
| Housekeeping                       | Backlog in filing                                                        | First management backed by provision of adequate resources including, if appropriate, clerical support |
| Organising the search collection   | Organisation of collection does not correspond with natural geographic boundaries | Reorganise                                                                     |
| **OBTAINING THE MARKS**            |                                                                           |                                                                               |
| Selecting the scenes to visit      | High level of non-productive visits*                                      | i) Review policy on selection of scenes to be visited  
ii) Ensure overall level of resources is adequate* |
|                                    | Inconsistency in level of service in different parts of force area        | Redistribute resources                                                         |
|                                    | Differences in workload per officer in different parts of force area      | Redistribute resources                                                         |
| Getting to the scene               | Excessive delay in responding to calls                                    | i) Ensure overall level of resources is adequate*  
ii) Review working hours |
|                                    | Frequency of occasions on which SOCOs share transport                     | Undertake time and cost analysis locally to determine  
   i) optimum fleet size  
   ii) optimum use of private transport |
| Collecting the marks               | Low number of marks recovered per SOCO*                                   | Retraining or relocation of individuals as appropriate                        |
| **MAKING THE MATCH**               |                                                                           |                                                                               |
| In-house bureau                     |                                                                           |                                                                               |
| Suspect checking                    | Low number of identifications per fingerprint officer*                     | Improve liaison with investigating officers                                     |
|                                    | High level of incorrect suspect suggestions*                              | Improve liaison with investigating officers                                     |
| Elimination prints                 | Requests for elimination prints outstanding for more than two weeks      | Consider use of contact paper                                                   |
| Mark to print searching             | Backlog of unsearched marks                                               | Ensure overall level of resources is adequate*                                 |
|                                    | Searches curtailed prematurely                                             | Review policy on breadth of searches                                            |
|                                    | Low number of searches per fingerprint officer*                           | i) Ensure overall level of resources is adequate*  
ii) Retraining or relocation of personnel as appropriate |
|                                    | Low number of identifications per fingerprint officer*                    | i) Ensure overall level of resources is adequate*  
ii) Retraining or relocation of personnel as appropriate |
| Print to mark searching             | Low level of identifications*                                              | i) Review policy on this type of searching  
ii) Monitor compliance with policy |
|                                    | Crime series not identified                                               | i) Review policy on this type of check  
ii) Monitor compliance with policy |
| Mark to mark checks                |                                                                           |                                                                               |
| Regional bureau                    |                                                                           |                                                                               |
| All searching                       | Low level of identifications*                                              | Review relationship with regional bureau                                        |
|                                    | High costs per identification                                             | Review relationship with regional bureau                                        |

**Note**

The diagnostic model will incorporate performance indicators that can be used as a means of identifying low performance levels in the areas marked *. 
not generally be cost-beneficial. There
is, however, one expedient which
many forces have already adopted — to
subdivide the collection geographically.

40 Most forces operate on the
assumption that the majority of crime
is committed by local offenders. It
makes sense, therefore, to start by
comparing marks with prints of
offenders in the immediate vicinity and
gradually radiate outwards. One force
doubled its number of identifications
after reorganising its forcewide collec-
tion into geographical sub-groups.

OBTAINING THE MARKS
SELECTING SCENES TO VISIT
41 Forces would require at least three
times as many SOCOs as they currently
employ if they were to send a SOCO
to all two million crimes where finger-
marks might be left. They therefore
have to be selective about which scenes
of crime they want them to attend.

42 Most forces require their SOCOs to
attend all serious offences and bur-
glaries. Burglaries therefore account for
the bulk of their workload — in the
forces visited, they spent between 69
per cent and 90 per cent of their time
on them. On the other hand, forces' polici-
es on theft of, and from, motor
vehicles vary considerably. In one force
they accounted for 4 per cent of the
SOCOs' workload while in another
force the figure was 16 per cent. A
similar variation was found between
the divisions of one force visited — a
range of 4 per cent to 13 per cent.

43 Overall, marks are retrieved from
approximately one in four scenes visited
by SOCOs. However, some forces con-
sider that, in addition to their investi-
gative role, SOCOs perform an impor-
tant public relations function. Other
forces take the view that this job can be
done by the investigating officer.

44 It is frequently claimed that the
time constraints placed upon SOCOs
as a result of a high workload mean
that visits are often brief and restricted
to the point of entry. Forces whose
SOCOs are visiting a high proportion
of scenes, but achieving a low yield of
marks per visit, should reconsider their
selection criteria. All forces should
monitor the yield of marks per visit in
order to make informed decisions when developing their strategy.

45 Once the force has clarified its
policy on scenes to be visited, it will
need to monitor its application to
establish whether:

— a consistent level of service is
provided throughout the force area.
In one force, the proportion of
relevant scenes attended varied
from 27 per cent in one division to
43 per cent in another;

— the level of resources allocated to a
particular area is consistent with the
workload. The time spent at the
scenes in that same force varied
considerably, with one SOCO
attending 49 scenes a month, and
another 107.

GETTING TO THE SCENE
46 It is important that SOCOs reach
the scene in good time. Some forces
operate with reduced SOCO cover at
weekends — the time when many
burglaries are committed. Delays of up
to three days can occur before SOCOs
attend. In the meantime the owner of
the property may have cleared up the
scene and unwittingly destroyed finger-
marks. Similarly, marks left outside at
points of entry can deteriorate in bad
weather. Working times should be
dictated by demand, and the time
taken to respond to calls monitored.

47 Most forces provide SOCOs with
vans equipped with all the necessary
equipment. Some forces however,
have insufficient vehicles and are
sometimes forced to send SOCOs out
in pairs. Most SOCOs spend a
substantial part of their day travelling
between scenes, and so sharing vehicles
is a false economy. Forces should
undertake analysis locally to establish
the optimum fleet size for their
SOCO force.

48 All the SOCOs in one metro-
politan force use their own cars in
return for mileage allowances. Clearly
this has potential drawbacks; in par-
ticular it may provide an incentive for
inefficient use of transport. The
optimum arrangement may well be for
the force to hold sufficient vehicles for
normal demand and allow the use of
private cars to cover for peaks. The
precise trade-off between the use of
private and force transport can be
calculated at individual force level by
using locally available data on costs
and mileages.

COLLECTING THE MARKS
49 Variations in the performance of
SOCOs can be startling, even within a
force. In one force, for example, some
officers regularly achieve around five
identifications a year while one of their
colleagues achieves between 70 and
100. The force could offer no
explanation for this other than in
terms of aptitude and personal
motivation, matters which are taken
up later. There must also, however, be
scope for better training and transfer of
good practices between SOCOs both
within and between forces.
MAKING THE MATCH

50 Assuming that the offender's print is filed in the collection and the SOCO has, in fact, collected his mark from the scene, the final stage in the process is to match them up.

51 All fingerprint bureaux process marks similarly. The steps are as follows:

1. Compare marks against named suspects—'suspect checks'.
2. Obtain elimination prints and check marks retrieved from the scene against them. (Steps 1 and 2 may often be reversed.)
3. Search suitable marks against fingerprint collections—'mark to print search'.
4. Search fingerprints of newly arrested persons against unidentified marks to clear outstanding cases—'print to mark search'.
5. Search new marks against collections of marks to identify crime series—'mark to mark check'.

52 Exhibit 11 illustrates the relative significance of these steps. Exhibit 12 overleaf illustrates the variation in performance between bureaux. It suggests there is scope for considerable improvements in productivity at all stages of the process. If all bureaux could achieve the productivity of the best quartile on each of the three methods of obtaining identifications (suspect check, mark to print searching and print to mark searching) then the total number of identifications achieved nationally would be increased from 40,000 to 57,000.

SUSPECT CHECKING

53 Of the 29,000 identifications from scenes of crime cases in 1987, 17,500 (60 per cent) came from 'suspect checking'—the process whereby the investigating officer submits a list of suspects to the fingerprint officer who then checks the marks against their prints. Approximately two-thirds of the 11,000 identifications from documents were obtained in the same way. The most successful quarter of bureaux achieved 75 or more identifications per fingerprint officer by this method whilst the least successful quarter achieved less than 40.

54 In some forces, investigating officers submit lists of suspects for checking even where no firm lead exists. This can create a downward spiral of performance: the bureau wastes time checking spurious suggestions, this leaves it less time for searching and it achieves fewer identifications, so investigating officers submit yet more suggestions in the mistaken belief that it is the only way to obtain better results. Such spirals must be broken. Some forces have done this by dedicating specific fingerprint officers to work on marks from particular divisions, thus fostering closer working relationships between individual fingerprint and investigating officers.

ELIMINATION PRINTS

55 'Elimination prints' are the prints taken from people with legitimate access to the scene of the crime. Because of the time involved in search-
ing marks, fingerprint officers normally only search those marks which remain unexplained after comparison with elimination prints. If elimination prints are not obtained, the marks concerned are filed for comparison against nominated suspects only.

56 Obtaining elimination prints is often afforded a low priority. The Commission has undertaken detailed analysis in two forces. In both cases, elimination prints were supplied in only one third of the cases for which the bureau requested them. Obtaining elimination prints and searching those marks not eliminated would lead to a substantial increase in the number of identifications obtained by the fingerprint service. Analysis in one force indicates that searching the marks that were not searched because elimination prints were not obtained could have increased the number of identifications by 28 per cent.

57 One force is experimenting with the use of contact paper to increase the number of elimination prints obtained. SOCOs take elimination prints from the relevant persons who are at the crime scene at the time of their visit, and leave a reply-paid envelope together with special purpose pre-inked strips of paper. Persons from whom prints have not been taken are asked to peel off a protective strip, touch the paper and then post it to the fingerprint bureau. Initial results are encouraging with in excess of 90 per cent of the requests for prints resulting in the supply of prints of satisfactory quality for elimination purposes.

MARK TO PRINT SEARCHING
58 Searching marks against prints yielded some 10,000 identifications last year—two-thirds from scenes of crime

Exhibit 12
PERFORMANCE OF FINGERPRINT BUREAUX

There is scope for considerable improvement in the productivity of the bureaux...

Note
This exhibit excludes results relating to those bureaux which did not submit details of the methods of obtaining identifications. For this reason the upper quartiles of these three data sets are not comparable with those in Exhibit 8.

Source: Audit Commission analysis of data obtained from the National Conference of Fingerprint Experts, 1987.
and the remainder from documents. Although this form of search yielded less than a quarter of total identifications, it accounted for a major part of the fingerprint officers' searching effort.

59 While the best quarter of bureaux achieve 24 or more identifications per officer from mark to print searching, the lowest quarter achieve less than 12. It is the method of identification offering the greatest potential for improvement because national statistics indicate that on average only one in four marks is searched. This average disguises a wide variation in the performance of individual forces—the inter-quartile range for the proportion of marks searched ranges from just over 10 per cent to almost 70 per cent. Even for those marks which are searched, the searching may be severely curtailed. For example, the search collection of one large metropolitan force is split into 27 separate geographically-based collections. Typically, searching will be terminated when a suspect mark has been checked against two or three of these. In another force, however, searching is only terminated when the entire force collection has been exhausted.

60 The first requirement for an efficient service is to ensure that marks are searched with the degree of thoroughness appropriate to the seriousness of the offence. The better organised the collection, the easier it will be to curtail the search at the appropriate point.

61 There are many factors which can influence how widely a particular mark is searched. These include:
— the gravity of the offence;
— the number of individual fingers included in the mark;
— whether the mark is of an unusual type;
— whether the offence appears to be one of a major series;
— resources available in the fingerprint bureau.

Each force should formulate a strategy for determining how widely to search given types of mark and consider how their collections could be reorganised to help fulfil that strategy.

62 It is particularly important that forces using both force and regional bureaux have clear criteria for determining which bureau searches which marks. In one force visited, all searchable marks were being searched simultaneously at both bureaux; if the force bureau achieved an identification, it would inform the regional bureau which would confirm the identification and claim it as an identification made by them.

63 It is also important that marks are searched promptly to apprehend the offender as quickly as possible. It has already been noted that in one force there were some 400 searchable but unsearched marks dated prior to 1986 and a further 82 for 1987.

64 Recently, many forces have installed a terminal linked to the Police National Computer (PNC). This provides an alternative search facility. Because of the way most collections are organised, in the majority of cases it is quicker to work through the force's own collection directly. Consequently, most fingerprint officers consider the use of the PNC is only justified in more serious offences. This facility has therefore had only a marginal impact on the fingerprint service.

MANAGING THE WORKFORCE

66 Although the productivity of the service will be increased considerably by adopting these suggestions, maximising the performance of individuals will also require better management of the workforce. In particular, forces need to:
• introduce individual performance monitoring;
• enhance job satisfaction;
• provide more administrative support;
• civilianise SOCO and fingerprint officer posts.
PERFORMANCE MONITORING

67 It has already been noted that in one force visited some SOCOs regularly achieve five identifications each per annum while another regularly achieves between 70 and 100. The force could offer no explanation for this variation other than aptitude and personal motivation. Comparable figures for the performance of individual fingerprint officers are not available though the average number of identifications per fingerprint officer for each force bureau ranges from 35 to 210 identifications per year. It is clearly essential that forces monitor the individual performance of both SOCOs and fingerprint officers to identify training needs and organisational barriers in order to maximise the productivity of the service.

JOB SATISFACTION

68 The work of a fingerprint officer can be exceedingly repetitive and in some forces this, combined with low pay, has had a serious effect on morale. It is understood that an ACPO Committee is currently reviewing pay and conditions in the fingerprint service nationally and should be reporting its findings later this year. In the meantime, however, some forces have taken steps at a local level to enhance job satisfaction. Two particular initiatives are worth mentioning.

69 One force with a comparatively successful fingerprint service interchanges staff between its scenes of crime and fingerprinting sections. The force has found this fosters a better understanding amongst fingerprint officers and SOCOs of each others’ job requirements, provides greater job satisfaction and results in better performance.

70 Several other forces with successful bureaux have sub-divided them so that individual fingerprint officers have responsibility for particular areas of the force. This means they deal with the same investigating officers all the time and are able to develop closer working relationships. This can result in a high level of accurate suspect suggestions from investigating officers and a greater feeling of personal responsibility by the fingerprint officer. Both these are measures which all forces can adopt easily.

ADMINISTRATIVE SUPPORT

71 Maintaining and updating the collections and other clerical records represents a large part of the workload of a fingerprint bureau. Typically around 30 per cent of the workload of a medium-sized bureau could be performed by clerical staff. In spite of this, some bureaux have no clerical support and all clerical work is undertaken by fingerprint experts. But it is really only in the highly skilled tasks of searching marks and establishing identifications where specialist fingerprint officers are required.

72 Not only are clerks a less expensive resource than fingerprint officers but, more importantly, the skills required of fingerprint officers are in short supply. Increasing clerical support in bureaux could increase the productivity and improve the job satisfaction of the fingerprint officers and, at the same time, reduce costs.

CIVILISATION

73 The service is becoming increasingly civilianised. By January 1986, 83 per cent of fingerprint officers and 25 per cent of SOCOs and photographers employed in UK forces were civilians. The civilianisation programme has, however, progressed much further in some forces than others. In several forces the service is completely civilianised while in others all SOCOs are still police officers.

74 The cost of employing a police constable, including all allowances, is roughly twice that of employing a civilian SOCO or fingerprint officer. Both SOCOs and fingerprint officers have been identified as key posts for civilianisation by HM Inspectors of Constabulary.

75 Civilianising those posts currently held by police officers would save about £8 million. If the service is to be expanded, as the Commission believes it should be, civilianisation has two advantages. Firstly, a programme of civilianisation can offset much of the cost involved in expansion. Secondly, because forces do not have to obtain Home Office approval to recruit civilians, they will be able to expand at their own pace.

INCREASING RESOURCES

76 It has already been noted that there is evidence that in general the fingerprint service is under-resourced. Increasing the number of SOCOs and fingerprint officers to a total of 75 per 100,000 notifiable offences should result in 1,400 scene of crime identifications being achieved per 100,000 notifiable offences (Exhibit 13). Ignoring any gains from improvements in efficiency, this would result in 44,000 scene of crime identifications nationally, an increase of 50 per cent over the present level. Increasing resources to this level would cost some £14 million a year. However, not all the time of the extra SOCOs will be devoted to fingerprinting and the cost attributable to
that activity will be about £10 million with the remainder being spent on forensic work.

77 Increasing resources to this extent will also impact on the number of identifications arising from offences involving documents. The size of this impact cannot be calculated precisely because the data available nationally is of limited reliability. The impact could be the equivalent of some 7,000 to 8,000 additional identifications per annum.

78 The overall level of resources made available to its fingerprint service needs to be assessed by each force in the context of its own priorities. If a force does decide to expand its fingerprint service then the increased resources could be applied in two ways:
• employ more SOCOs in an attempt to obtain more marks;
• employ more fingerprint officers in an attempt to identify more of the marks already collected.

79 Which of these alternatives each force should adopt will depend on local circumstances, in particular:
• the balance between the force’s capacity to collect marks and to search them with the appropriate degree of thoroughness;
• the level of performance of various parts of the service, particularly the proportion of identifications arising from suspect checks and mark to print searches.

80 The significance of this latter point is that, in some areas, it may be easier for investigating officers to compile accurate lists of suspects to be checked by the fingerprint bureau than in others. In this case, the force concerned would maximise the number of identifications achieved by maximising the number of marks collected and thus giving investigating officers every opportunity to make suggestions. Conversely, where investigating officers have difficulty in compiling an accurate list of suspects for checking, the force will need to concentrate its resources on searching the marks it does collect with the appropriate degree of thoroughness. Nationally the variation is very wide with suspect checks accounting for 21 per cent of all identifications in one force but 90 per cent in another.

Exhibit 13
INCREASING RESOURCES

Virtually all forces could benefit from increasing the number of officers they employ in the fingerprint service, at least up to the highest level of staffing currently existing ...

![Statistical footnote](image)

The regression equation is \[ Y = 71 + 19.7X \]

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>Stdev</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-71.4</td>
<td>243.7</td>
<td>-0.29</td>
</tr>
<tr>
<td>SOCOs + FOs per</td>
<td>19.65</td>
<td>4.43</td>
<td>4.43</td>
</tr>
<tr>
<td>100,000 identifiable offences</td>
<td></td>
<td></td>
<td></td>
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</table>

R-sq = 48.3%

This regression establishes that forces with the higher number of Fingerprint Officers and SOCOs per 100,000 notifiable offences tend to achieve more identifications per 100,000 notifiable offences. Further statistical analysis using curvilinear regression failed to establish evidence of turnover in the data, i.e. there is no evidence of diminishing marginal returns as resources are increased.

Although the relationship between resources and identification is highly significant, it is of limited strength. The R-sq value of 48.3% indicates that only this proportion of the variation is explained by the linear relationship. This highlights wide differences in performance between individual forces, consistent with the argument made in the main body of the text, that there is substantial scope for improvement in efficiency in some forces.
Although the optimum ratio of SOCOs to fingerprint officers will vary depending upon local circumstances, analysis at national level suggests that it will be within the range of 1.6 to 3.2 SOCOs per fingerprint officer.

What is clear is that, as the overall level of resources available to the service increases, the balance between the number of SOCOs and fingerprint officers will need to be reviewed. This is because at low levels of resources fingerprint officers spend most of their time maintaining collections and undertaking suspect checks. As resources increase, more time will become available for the fingerprint officers to undertake mark to print searches. This time can be channelled in one of three ways:

— searching more marks;
— searching the same number of marks more widely, e.g. throughout the whole of a force’s collection, rather than a subset of it;
— increasing both the number and width of searches.

Whichever of these options is adopted, because searching is relatively labour intensive, forces’ progress down this road will require them to change the ratio between fingerprint officers and SOCOs.

Thus, forces will have two key decisions to make:
• to what extent should the additional resources be dedicated to collecting, as against searching, marks?
• in which of the three ways referred to above (paragraph 82) should any additional searching effort be channelled?

The answers will vary from force to force depending on local circumstances.

For this reason, forces should monitor locally the effect on identification rates of marginal changes in the level of resources dedicated to scenes of crime work and to fingerprint searching, and of changes in their practices in searching marks. In this way forces can proceed systematically to identify the optimum solutions for them.

The Role of Technology

The Home Office research into the use of advanced technology based on AFR was referred to in paragraph 22. It is not yet certain when, or even if, this system will become available to all forces. Forces need to consider, therefore, whether less advanced technologies can augment existing systems for the next few years.

Existing Technology

Searching marks against existing manually maintained fingerprint collections involves selecting the appropriate fingerprint sets from the collection, comparing them to the suspect mark and then returning the prints to the collection. It is in the retrieval and refiling process that the existing technology is able to make an impact, and thus could offer a solution to those bureaux struggling to cope with their workload.

There are two such image storage and retrieval systems currently available:

— a microfiche based system brand named Digitscan, supplied by Amber Technology. Two forces have been using this system for a number of years while a further five have purchased the equipment within the last 12 months;
— a system based on optical disc manufactured by Ampex Great Britain Ltd. This system is currently in use on an experimental basis with the South Western Fingerprint Bureau in Bristol.

It is understood that one force is shortly to introduce a third system, De La Rue Printrak.

The key advantages these systems offer the user are:

— the need to retrieve and refile prints manually is eliminated;
— the fingerprint officer may prescribe any parameters considered relevant such as geographical limits and so, if required, reduce the number of comparisons that have to be made;
— the fingerprint officer no longer needs to maintain search collections in addition to the main collection. As well as the reduction in work in the fingerprint bureau, this also means the force need only take one set of fingerprints for its own purposes, with a consequent saving in time for arresting/custody officers;
— sharing of databases between different forces to facilitate cross border searches is possible. Three neighbouring forces using Digitscan equipment are currently providing each other with duplicate microfiches of parts of their collections for this purpose;
— any system linked to the PNC frees the force concerned of all work associated with the maintenance of the index and the classification of new prints, since it is already undertaken at the PNC.

Exhibit 14 gives an indication of the costs a force would need to consider...
Fingerprinting offers a powerful way of solving crime. The Commission considers there is considerable scope to exploit that potential further. All forces should liaise with their local auditor to:

- use the Commission's diagnostic model to identify their opportunities for improvement;
- identify and take the appropriate action as outlined in this paper to realise those opportunities for improvement;
- determine their optimum level of staffing and the optimum ratio of scenes of crime to fingerprint officers by monitoring the impact of marginal changes in resource levels;
- consider the potential for mechanisation of the filing and retrieval of fingerprints, using the systems currently available.

C O N C L U S I O N

92 For the above reasons, the Commission finds it difficult to give definitive guidance on whether forces should adopt these systems. Clearly, the Ampex equipment represents a significant capital investment and should not be purchased without a proper cost benefit analysis. However, for small and medium sized forces, the acquisition cost of the Digitscan equipment is likely to be low enough that, provided efficient arrangements are made for back conversion, it probably represents a worthwhile investment, written-off over the gestation period of AFR.
ACKNOWLEDGEMENT

The preparation of this Police Paper has benefited from the cooperation of a large number of police officers and civilians to whom the Commission is extremely grateful. The following forces have been visited in the course of this work:

Cambridgeshire, Derbyshire, Devon and Cornwall, Greater Manchester, Humberside, Leicestershire, Lincolnshire, North Wales and West Mercia.

The Commission would also like to thank the National Conference of Fingerprint Experts for allowing access to national data on the performance of the fingerprint service, collected by the NCFE early in 1988, and on which much of the statistical analysis undertaken during the production of this paper is based.

Several other bodies have also made a number of helpful comments including the Association of Chief Police Officers and Her Majesty's Inspectors of Constabulary. As with all the Commission's publications, however, responsibility for the conclusions lies with the Commission alone.
The diagnostic model is in the form of a hierarchical tree, and has three main branches—the right hand branch dealing with the work of SOCOs, the centre with the work of fingerprint officers on scenes of crime marks, and the left hand branch dealing with the work of fingerprint officers on documents such as cheques and DHSS vouchers. The diagram (right) is a schematic outline of the model.

The histograms incorporated show the range of performances in provincial forces for a selection of performance indicators. The actual data relating to one force is marked. At the highest level, (1) the performance of this force in terms of the number of persons identified as a proportion of the number of relevant offences is poor. Although the force is identifying a high proportion of the marks it does recover, (2) its overall performance is still low because it recovers so few marks.

Moving down the model, (3) it can be seen that a key factor is that the proportion of scenes yielding marks is low. This may be because the workload per SOCO is high (4) causing them to rush their examinations. The relatively low number of marks recovered is again reflected in a low workload per fingerprint officer (5), which could be a contributory factor to the low number of identifications per fingerprint officer (6).

Thus initial indications are that efforts to improve performance in this force should focus on activities at crime scenes rather than in the fingerprint bureau itself. It is through this kind of analysis that the full diagnostic model will help to identify areas in which opportunities for improvement may exist.
MODEL – SCHEMATIC OUTLINE

of crime marks

Work of scenes of crime officers

Persons identified
Relevant offences

Persons identified
Cases with marks

Persons identified
Cases with marks

Cases with marks
No. of FOs

Cases with marks
Relevant offences

Cases visited
Relevant offences

Cases with marks
Scenes visited

Scenes visited
No. of SOCOs

Scenes visited
Relevant offences

Persons identified
Scenes visited

Persons identified
No. of SOCOs

Suspect ids
No. of FOs

Persons identified
No. of SOCOs