Tilley Award 2005

Application form

The following form must be competed in full. Failure to do so will result in disqualification from the competition.

Please send competed application forms to Tricia Perkins at patricia.perkins@homeoffice.gsi.gov.uk

All entries must be received by noon on the 29 April 2005. Entries received after that date will not be accepted under any circumstances. Any queries on the application process should be directed to Tricia Perkins on 0207 035 0262.

1. Details of application

Title of the project
'***The Human Chassis Numbe**r*'

Name of force/agency/CDRP:
Hertfordshire Constabulary – Central Area Road Policing Tactical Team

Name of one contact person with position/rank (this should be one of the authors):
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Name of endorsing senior representatives(s)
Simon Ash

Position and rank of endorsing senior representatives(s)
Deputy Chief Constable

Full address of endorsing senior representatives(s)
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Hertfordshire
AL8 6XF

2. Summary of application

HERTFORDSHIRE CONSTABULARY

'THE HUMAN CHASSIS NUMBER'

SCANNING

In September 2003, Hertfordshire Constabulary set up a road policing team to proactively target criminals using motor vehicles to commit crime. The team found that the potential benefit of Automatic Number-Plate Recognition (ANPR) technology was not being fully realised due to technical limitations. There was no capability to link intelligence, on the national ANPR databases, with known individuals in the absence of a number-plate match.

ANALYSIS

- Analysis revealed that there was a problem with the databases not being able to cross reference individuals to multiple vehicles.
- Inability to have rear facing internal mounted IR cameras.
- Inability to view pictures of offenders within police vehicles to assist in roadside identification.

Given these findings, the team decided that they needed to find a solution to ensure that ANPR continued to be an effective crime fighting tool.

RESPONSE

- The team worked in partnership with PIPS Technology to find a solution to the world-wide problem of infra red cameras inability to read through rear windscreens.

- The innovative ideas put forward by the team, led the company to make an offer for them to design a bespoke police interface free of charge. This Incorporated PNCID cross referencing and picture files

Cross- referencing enables an individual's unique number to be searched against the national databases whether linked to a vehicle or not.

Partners included:-

Pips Technology UK
Pips Technology USA
Pilkington Glass
Specialist Japanese Laboratory
ACPO ANPR Group
Hertfordshire Magistrates Courts

The result of commercial/police collaboration has enabled: -

- The world's first rear screen glass technology facilitating internal IR camera mounting.
- Amendment to the ACPO National template to include unique individual identification, {Police National Computer Identity Number (PNCID)} in all UK ANPR databases.
- New ANPR software allowing cross- referencing of these databases and picture files.
- One of the largest intelligence database in the country.

The Home Secretary described the developments as "very exciting".

ASSESSMENT

This pioneering initiative by the team has become part of the blueprint for ANPR development nationally. PNCID cross-referencing has assisted the team in highlighting and targeting the criminal. 50% of offenders arrested by the team are for priority crime offences, (19% above the ANPR National average).

Cross-referencing could provide every officer nationally, the opportunity to obtain the ANPR intelligence on a person, whether they are in a vehicle or not, from a desktop computer.

3. Description of project

'<u>The Human Chassis Number</u>'

<u>SCANNING</u>

In September 2003, Central Area formed a new team of roads policing officers (1 Sergeant and 5 constables) to proactively target criminals using motor vehicles to commit crime. Automatic Number-Plate Recognition Systems (ANPR) were fitted in their vehicles.

ANPR, although innovative, is simple technology. It requires a camera to capture a vehicles registration number, software to read the capture and databases to hold the Intelligence associated with that vehicle.

If a match is found on the databases then the information is displayed to the officers for appropriate action.

ANPR databases are created from intelligence sources and consist of a minimum of two mandatory fields, which include a vehicle registration number (VRM) and information. The VRM field is the <u>only</u> one used by the ANPR system to retrieve the information.

Databases are shared nationally by police forces and relevant agencies and can be updated daily. In September the team had access to 40 different databases.

The team's deployment was driven by the Tasking & Co-ordination Process, identifying crime hotspots and targeting proactive deployment of ANPR in those areas. This proved to be an effective strategy.

Over the next three months the team began to notice that the criminal was becoming more aware of the ANPR technology.

- Intelligence interviews with offenders revealed that they were ANPR aware and that they were using the following evasive tactics to avoid arrest:-

- Cloned vehicles with stolen number- plates. (13.92% increase in 1st quarter of 2005)[1]
- Avoidance of ANPR fixed sites.
- Identification of ANPR fitted police vehicles.
- Travelling across force borders to commit crime in multiple vehicles where the offender was less well known to the police.
- The use of different modes of transport to travel and commit crime i.e. buses, trains, tubes and taxis.[2]
- Provide false details to officers at the roadside.[3]

Concerned with these new findings, the team asked themselves the following questions:-

- Is the ANPR system less effective because of our methods of deployment?

  OR

- Is there a weakness with the ANPR system itself?

Scanning revealed two weaknesses with the ANPR system:-

1. Every ANPR system uses Infra- Red cameras to read number-plates at night.

- Nationally these cameras were externally mounted on police patrol vehicles in a fixed position because the infra red illuminators were unable to penetrate the ultra violet filters incorporated in car glass.
- By external mounting the read capability of these cameras was reduced by inclement weather.
- They are highly visible.
- No in car adjustment.

2. ANPR software was unable to cross- reference a person to different vehicles held on the national databases.

- Officers at the roadside were unable to retrieve all the intelligence about a person if they were linked to multiple vehicles on the databases.
- The technology was only available to intercept teams who had use of ANPR systems and camera's.
- Inability to view pictures of offenders at roadside to assist with identification.

Problem

The potential benefit of Automatic Number-Plate Recognition (ANPR) technology was not being fully realised due to technical limitations. There was no capability to link intelligence, on the national ANPR databases, with known individuals in the absence of a number-plate match.

ANALYSIS

The team identified that the ANPR software did not have the facility to cross-reference an offender to multiple vehicles. The absence of a unique reference number for individuals on ANPR databases made this impossible, only allowing intelligence to be retrieved one vehicle match at a time. Officers at the roadside were unable to retrieve all of the ANPR intelligence on a person because it was linked solely to a number-plate.

Officers complained that the external fixed mounting of the infra red cameras for night time use was restricting their operational deployment. The cameras were affected by adverse weather conditions and the fixed mountings meant that it was awkward for officers to position the camera correctly to read number-plates, particularly when driving along.

Officers also commented that their ANPR vehicles were becoming well known. Offenders when stopped stated:

'We know the cars which have ANPR fitted as they have the cameras on the roof.'

As a result the team carried out a review of their current ANPR working practices using the national intelligence model principles:-

Level 3

They analysed the national databases and found the following trends: -

- All of the national ANPR databases contained a hard core of criminals who committed multiple offences in different vehicles.

National statistics showed that Priority and Prolific Offenders (PPOs) were responsible for half of all crime committed in the United Kingdom with the hard core of these criminals responsible for 1 in 10 offences.[4]

Level 2

At cross border level, analysis revealed the following trends:-

Offenders were being stopped travelling into our county to commit crime. The vehicles being driven were unknown to police in Hertfordshire and in many cases were classed as 'pool' vehicles. Data relating to offenders, known to police and recorded on the surrounding police forces' databases, could not be retrieved unless the offender used the same vehicle to commit a crime.[5]

Level 1

At a local level, the team dip sampled their own areas' ANPR intelligence databases, revealing the following trends:-

- There were over 60 priority and prolific offenders (PPOs) that used multiple and or pool vehicles.
- One offender was linked to 17 different vehicles on the database.

Given these findings, the team realised that much of the intelligence held on the national ANPR databases could not be accessed, dramatically reducing the potential of the system. To overcome this problem, they sought solutions to make ANPR technology both vehicle and person specific. This would allow it to become a more effective intelligence driven crime-fighting tool.

A number of enhancements to ANPR systems would be needed to assist the police in countering the offender's evasive tactics: -

Technical enhancements

After analysing the problems with the fitment of infra red cameras, it was identified that the ideal solution would be mounting IR cameras inside vehicles.

Internal mounting would result in the cameras and ANPR vehicle being less conspicuous to offenders who are ANPR aware. This would also overcome the effects of adverse weather conditions and allow ANPR to operate more efficiently, 24 hours a day. To achieve this, the following solutions were sought:

- Infra Red glass solution.
- Pan and tilt motor, which would allow for it to be controlled and operated from within car.

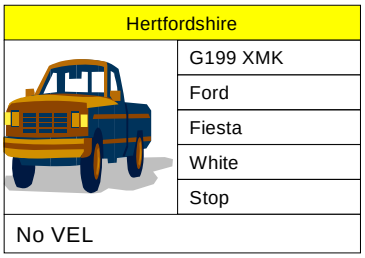
Cross referencing of databases

To facilitate effective cross-referencing of persons and vehicles, an additional unique number field within ANPR databases would be required. The team identified that the most suitable unique number to use for police purposes was one that had been recognised nationally for 40 years. Every individual entered onto the Police National Computer is allocated a unique number. This is the Police National Computer Identity Number (PNCID) which the team nicknamed 'the '***HUMAN CHASSIS NUMBER'.*** This number is unique to a person and is recognised by every law enforcement agency across the country.

The Police National Computer (PNC) holds historical information about what a person has been up to, whether they are wanted or missing, or have warning markers attached to them. A PNC check will only reveal this historical data. It will not allow retrieval of current intelligence held on national ANPR databases. Cross-referencing for ANPR purposes utilises a PNC check to obtain the unique PNCID number of a person but in order for this to work, the following enhancements needed to be made to the ANPR systems: -

- The creation of a unique field for the PNCID number.
- Recognition and standardisation of the national database template by ACPO to include the PNCID number.
- New ANPR software to be written to incorporate the PNCID search facility complying with all national standards.

Traditional ANPR HIT

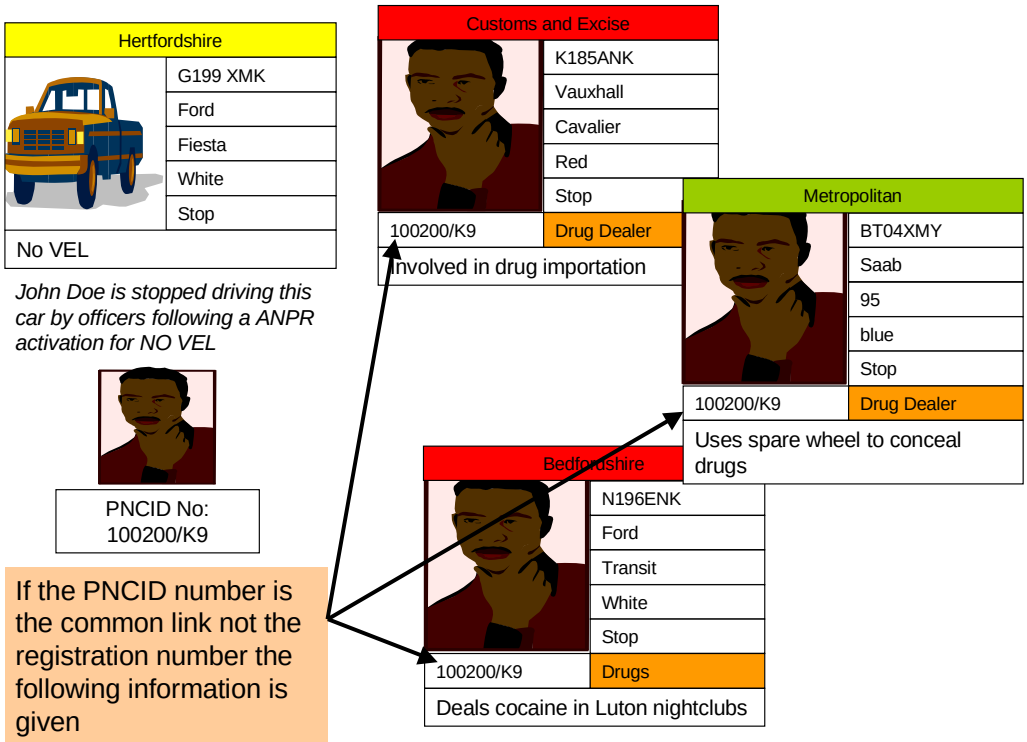


John Doe is stopped driving this car by officers following a ANPR activation for NO VEL. He is issued with a NEFP ticket for ? 0 and goes on his way

PNCID No:
100200/K9

This template demonstrates a scenario where an offender was fined £ 60 after a traditional ANPR activation. The ANPR system was only capable of providing the intelligence linked to that number-plate match although he was linked to other vehicles on the databases.

ANPR HIT using PNCID and VRM cross referencing

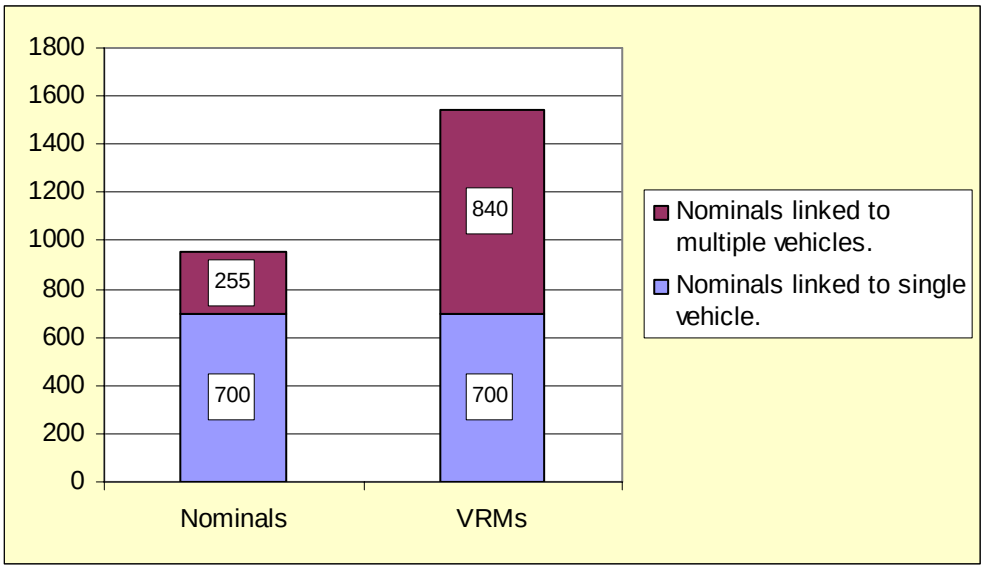


A PNC check would provide a 'drug warning marker' and the offender's PNCID number but not the details of these three cars or the intelligence attached to them. The increased intelligence has significant implications for possible arrest.

The team had further in depth analysis conducted to assess the benefit of using the PNCID number in the local ANPR database. The 3 graphs below show how it was confirmed, using the PNCID number as a cross referencing field, that significant percentages of individuals on ANPR intelligence databases, disqualified drivers and Prolific and Other Priority crime Offenders (PPOs) use multiple vehicles.

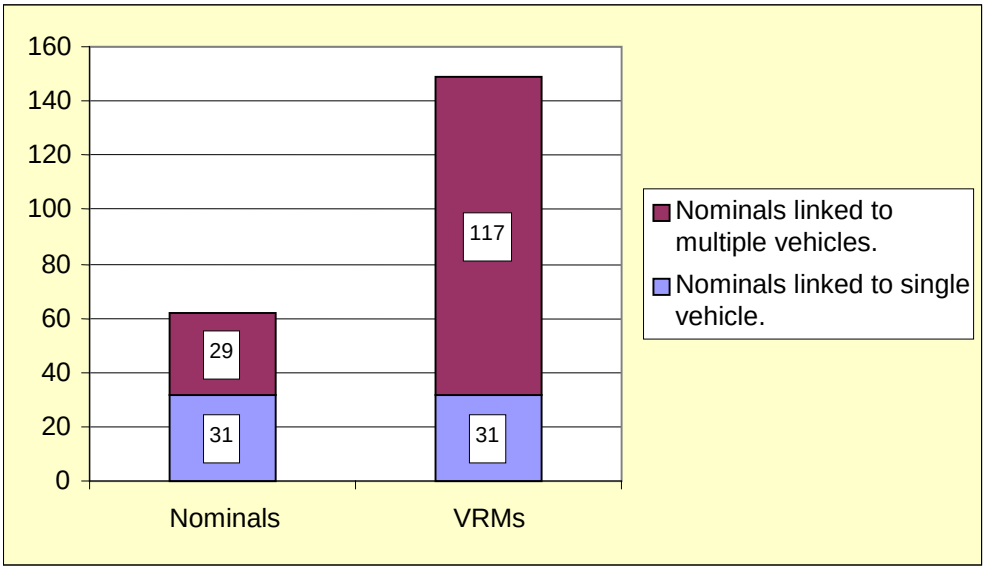
Figures to show % of database entries that can be linked to multiple vehicles

Central Area Disqualified Driver Database



The chart above shows that 36% of nominals are making up 55% of the vehicle entries in the Disqualified Driver database.

Central Area Prolific and Priority Offender (PPO) Database



The chart above shows that 48 % of nominals are making up 79 % of the vehicle entries in the PPO database. Of these PPO nominals 33 % of them are Disqualified Drivers and can be cross-referenced in the Disqualified Driver database.

In both the above examples, PNCID cross-referencing would enable identification of every vehicle that nominals have access to, increasing ANPR's capacity as an intelligence tool.

Analysis highlighted the inability of ANPR databases to cross-reference individuals to vehicles. Between 12% - 48%, (dependent on database used) of Hertfordshire's offenders could be linked to multiple vehicles by PNCID.

Fingerprint scanners and Picture files

Proposed new legislation allowing the fingerprinting of individuals at the roadside for identification purposes (Project Lantern) will, if introduced by parliament, make PNCID numbers available to operational officers in 'real time'. This would dramatically reduce the ability of offenders to escape detection through provision of false details and reduce the number of Section 25 PACE arrests [6]. However, in the absence of PNCID cross referencing in national ANPR databases, the amount of intelligence available would be restricted and an opportunity missed to reveal offences that may not have otherwise been detected, as in the scenario on page 6.

Until the fingerprint facility is legal and operational the use of pictures files of offenders within ANPR would be a useful alternative for identification purposes.

RESPONSE

Response implementation focussed on countering the use of evasive tactics by criminals.

November 2003

South Yorkshire Police featured in a 'Police review' article highlighting a development project with 'PIPS technology' a leading ANPR manufacturer who produced specialist glass allowing covert use of infra red cameras through front windscreens.

The team wanted to use front and rear facing cameras and contacted PIPS technology who informed them that at that time Infra red rear windscreens could not be made due to the difference in the manufacturing process of front and rear screen glass. The company were tasked to find a solution to enable Infra Red cameras to be used through rear windscreens. Potential commercial gain provided the lever for involvement and investment from a business partner. The "What's in it for me?" principle was used and an offer was made to work in partnership with them to act as a test bed for any product provided.

January 2004,

PIPS technology identified that the team was a small forward thinking unit who wanted to improve ANPR technology.

Following discussions with the team, PIPS technology made an offer to work in partnership and develop the PNCID cross-referencing concept and picture files into their own ANPR interface. The software development was to be provided free of charge.

PIPS technology informed the team that a specialist laboratory in Japan had developed a new manufacturing process that allowed infra red rear windscreens to be produced.

This project was agreed by Hertfordshire Constabulary and was supported locally. The team set about designing a completely new ANPR solution that was compliant with the National Intelligence Model.

A series of PowerPoint templates were produced showing the teams vision of how each ANPR screen should function. The design was based on the style of a book and was broken down into sections incorporating an index, chapter and pages.

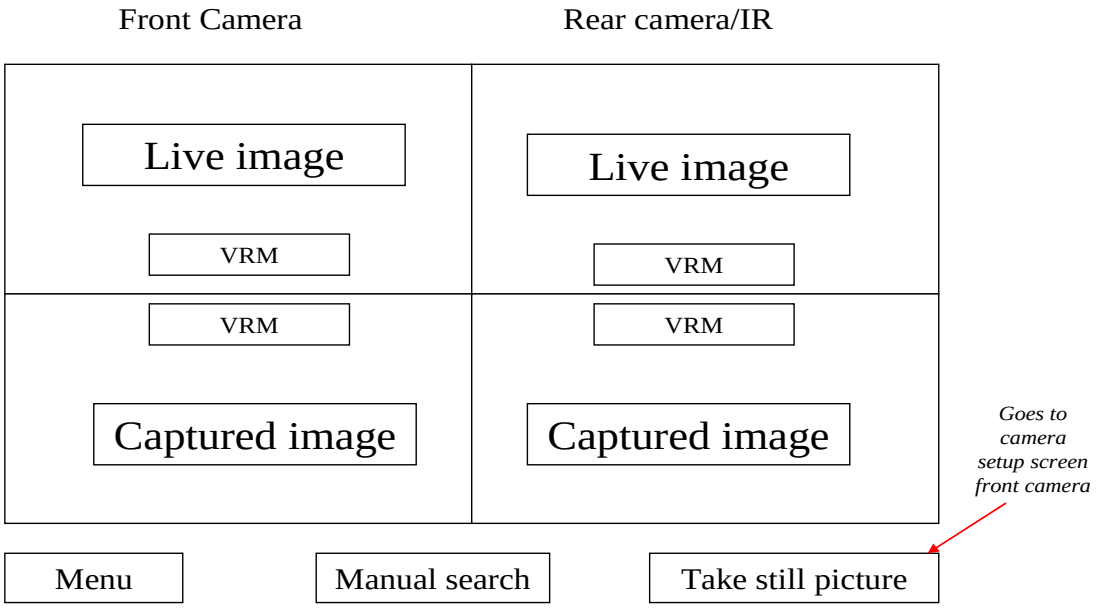
The companies American Head Office approved these templates which became the working model for the software. Development was commenced in the United Kingdom, Hungarian and American Offices under the project name 'PAGIS'

The team suggested the use of the acronym PAGIS (Police ANPR Graphical Interface System).

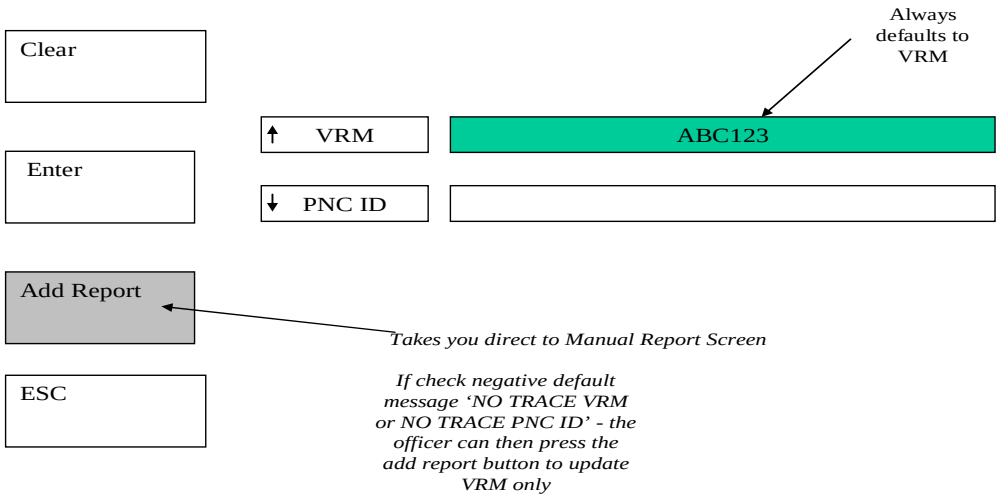
Some examples of templates produced: -

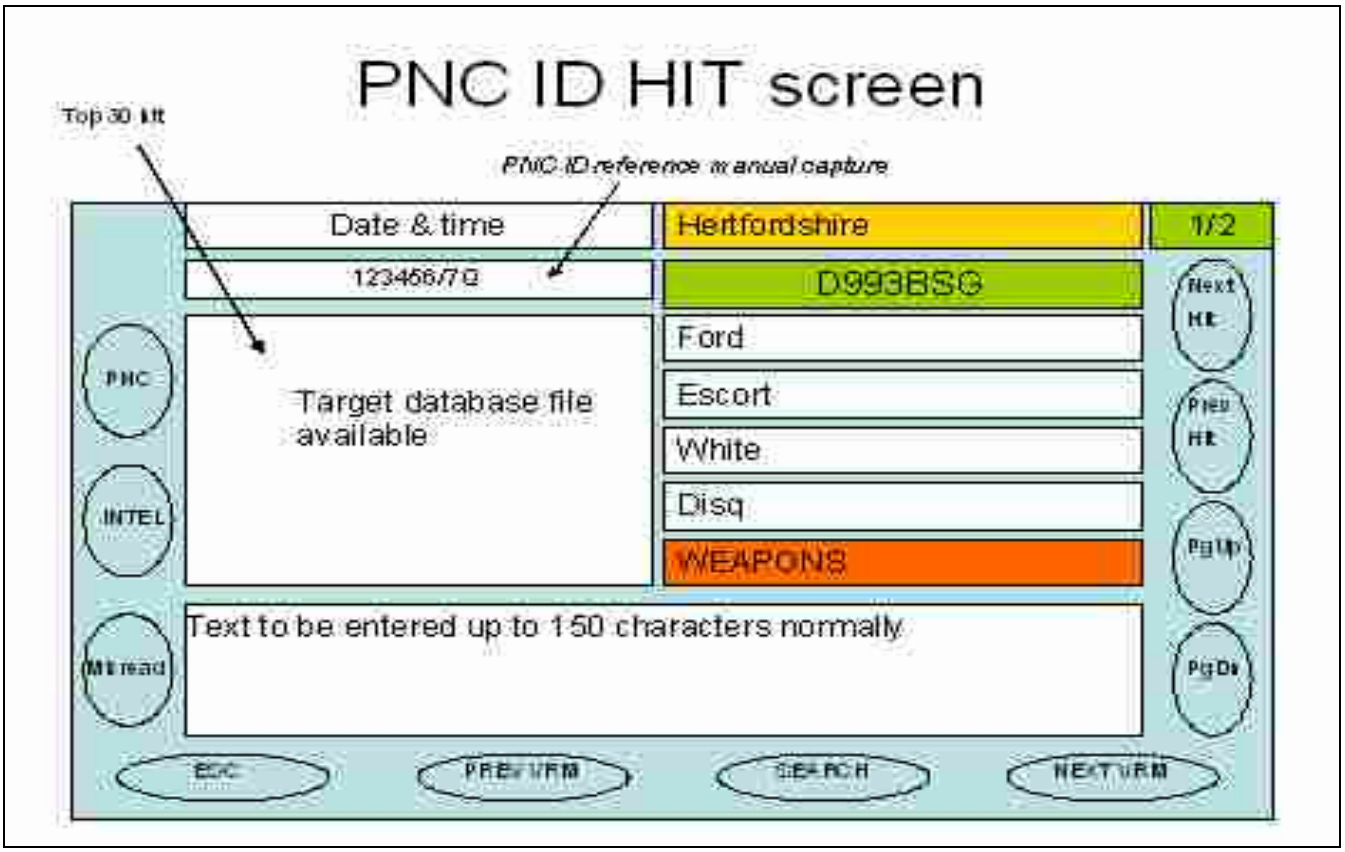
NB: Record GPS info on hit where fitted

Read Screen

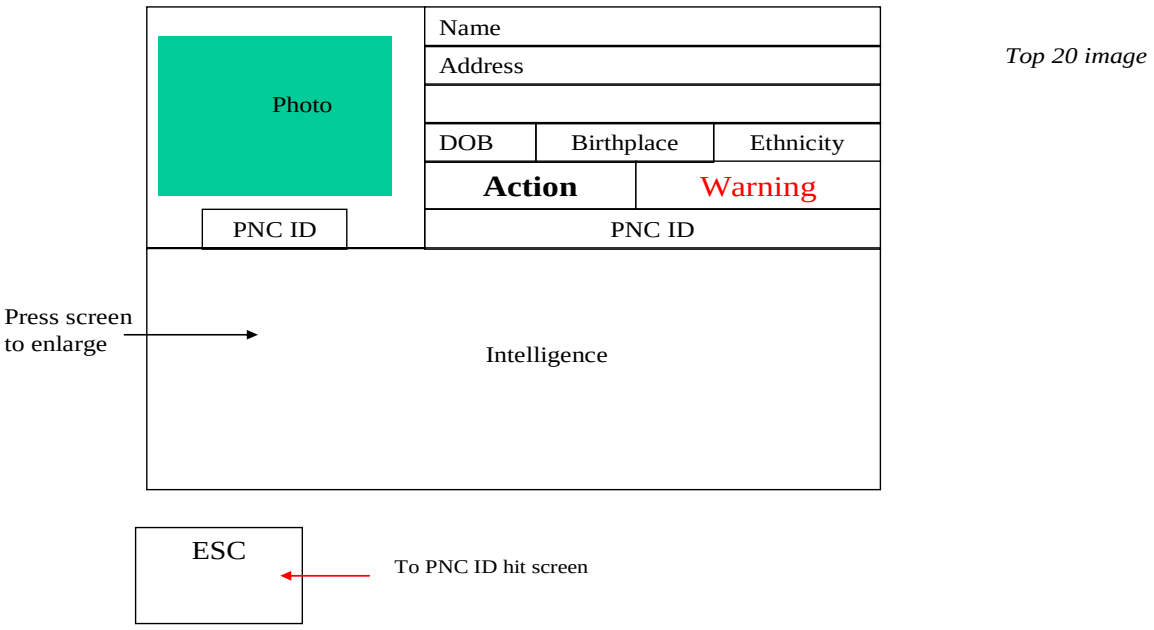


Manual search screen





Target database Screen



Top 20 image

February 2004,

A laboratory in Japan, in company with Pilkington Specialist Glass Division and PIPS technology manufactured a prototype rear windscreen. This was supplied free of charge to the Constabulary and fitted in a brand new Volvo V70 estate for research and development purposes. This was the first vehicle in the world to have this windscreen and utilise an infra red camera this way.

April 2004,

A prototype version of the ANPR software solution was completed incorporating: -

1. PNCID cross-referencing. This allowed the team to develop the first person specific ANPR database searchable for an individual in addition to vehicles.
2. The creation of picture files for offenders and missing persons to assist in identification at the roadside.
3. Intelligence updating of stop checks at the roadside.
4. Facility to take still images of offenders at the roadside and link this to the PNCID number for an intelligence submission.
5. The ability to search national ANPR databases without a VRM being present.
6. Potential for improvements in offender profiling.

May 2004

The new infra red glass technology and ANPR software was exhibited at the NEC ACPO Exhibition in Birmingham.

Delegates from around the world were shown the cross-referencing idea. Here the team explained that any unique number could be used for cross-referencing of the databases and recognised that in Europe the national identity card number of an individual could be used.

The then Home Secretary Mr. Blunkett said, *"The developments are very exciting"*

June 2004

The car and software was displayed at ACPO National ANPR Conference (Dunchurch).

Chief Constable Richard Brunstrom, (Head of ACPO Road Policing) commented "*I'm very pleased to see innovations like this*"

John Dean (ACPO ANPR Steering Group Lead), said, *"This idea has massive potential"* expressing surprise at the speed of development (4 months).

October 2004

The team was invited to present their PNCID cross-referencing idea to the National ACPO ANPR User Group in Southend, Essex.

The presentation resulted in ACPO adopting the idea nationally and has incorporated it into the national template for file creation, which will be used by all forces for ANPR purposes.

October 29th 2004

POLICE REVIEW ran article about 'FUTURE RECOGNITION' highlighting development work being carried out by the team. [7]

November 2004

During conversations with the Hertfordshire Court Service regarding Non Payment of Fine Warrants issued by the court it was identified that there was no means to share information electronically with the police as the computer systems were incompatible.

The team explained the benefits of including the PNCID number and/or vehicle registration numbers of offenders when warrants were issued from the court results. By utilising the PNCID search facility the courts could have their data loaded onto the ANPR system and searched to enable police to execute this type of warrant.

February 2005

PIPS technology (USA) started trials on the PAGIS software designed by the team in 12 state trooper patrol cars in America incorporating the cross referencing idea.

March 2005

Hertfordshire Police completed its £1.0 million European tender bid process and invited two manufactures to work in partnership with them to extend their ANPR strategy. Both PIPS technology and Cleartone-vision have incorporated PNCID cross-referencing into their products.

Cleartone-vision is currently in the process of upgrading all of the national ANPR spectrum vans to make them BOF 2 (Back Office Facility) compatible to comply with the national database warehouse standards.

April 2005

PIPS technology received a commercial contract to supply the Dutch police with the PAGIS ANPR software. Their national identity card number could be used as a means to cross-reference an individual to the vehicle registration mark in the databases in Holland.

The software has been requested by an Australian law enforcement agency for evaluation.

Hertfordshire Constabulary as part of the IMPACT [8] programme is using the PNCID number to search all of the corporate computer systems for a reference to the individual. This falls in line with the new code of practice for managing police information and the information management.

8th April 2005

POLICE REVIEW ran a further article titled 'GOT YOUR NUMBER'.

Frank Whitely (Chairman of ACPO ANPR steering Group) travels through time to land in an imaginary basic command unit in 2008, where ANPR technology is being used to its full potential to catch criminals. [9]

During the article Mr Whitely refers to the use of :-

- PNCID cross referencing
- Accessing ANPR databases from control rooms
- Execution of fail to appear warrants which account for 15% of ANPR arrests
- Identification and seizing of pool vehicles.
- Mobile fingerprint devices.

ASSESSMENT

Problems identified by the team have been addressed and the speed of implementation is indicative of the importance the initiative has to national ANPR practice. Development work has not only been adopted nationally but has begun to have international implications (e.g. Los Angeles Police Department purchasing PAGIS software in April 2005).

The responses implemented were effective, simple, cost effective and have significant implications for the effectiveness of ANPR and its intelligence databases.

One major barrier to implementation, shifting the paradigm that ANPR was purely based on the capture of number-plates through cameras, was overcome with the National ACPO ANPR User Group amending its template. John Dean (ACPO lead) stated that *'ACPO included the PNCID into the national template as they recognised that it opened up further opportunities for ANPR to be successful for officers at the roadside.'*

Infra Red Glass Solution

The prototype infra red rear windscreen fitted in the Volvo V70 for research and development purposes has been highly successful. The infra red camera mounted in the vehicle can be deployed effectively 24 hours a day and its read capability has not been affected by inclement weather conditions.

Operational officers have commented that the functionality of the camera has been greatly improved. Users can now adjust the camera to meet all the different road conditions to allow a greater read rate. Criminals are finding it more difficult to spot the ANPR equipped vehicles as the infra red camera is now mounted inside the vehicle.

A number of police forces around the country have visited Hertfordshire and are now fitting these windscreens to their police vehicles.[10]

The technological enhancements brought about by the team and their business partners to the ANPR equipment have solved problems identified in the Home Office PA Consultancy report, which states*, 'ANPR intercept teams can be disrupted or restricted due to poor weather and darkness.'* [11]

Following a recent visit to Hertfordshire Constabulary, Richard Stevens (ANPR project team PSDB 1976 – 1984) stated *' I thought that the infra red windscreens were great.'*

PNCID Cross Referencing

The PNCID cross-referencing initiative has proved to be highly successful and is growing from strength to strength now that the new national ANPR template for file creation has been finalised.

PNCID cross-referencing in Hertfordshire has allowed the team to effectively target the criminal who uses motor vehicles to commit crime. The initial trials have shown that an offender can be linked to multiple vehicles. Cross-referencing has assisted detailed offender profiling. This is exemplified by their involvement in a cross-border (level 2 NIM) operation. The team was part of an operation involving a group of night time burglars who resided in another police area. These offenders were breaking into people's houses to steal car keys in order to steal high value vehicles off their drives. This operation involved offenders from surrounding police forces. By utilising PNCID cross-referencing the ANPR system was able to return all the vehicles the suspects had access to on both the Bedfordshire & Hertfordshire databases.

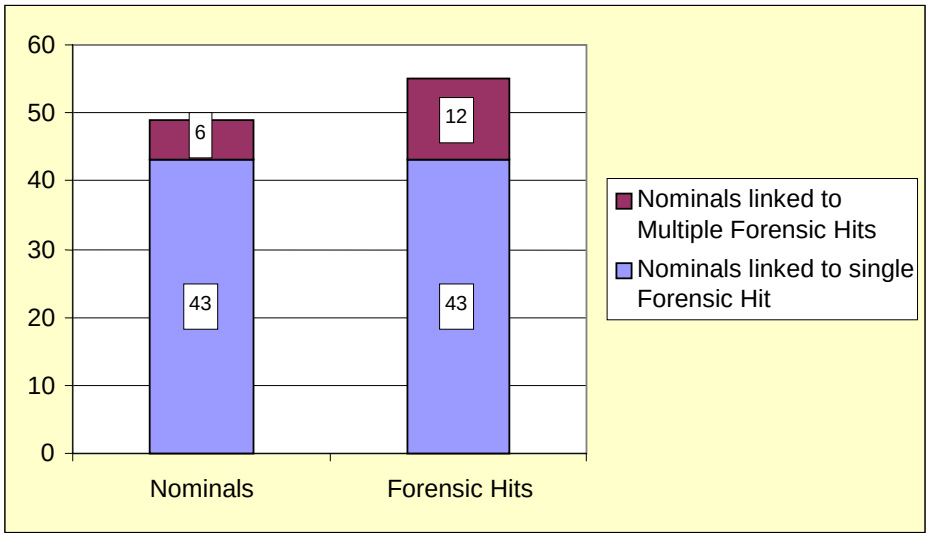
Detective Chief Inspector Jeremy Tattersall from Hertfordshire Constabulary reported in the Bedfordshire press, '*Criminals especially those in organized enterprises such as the one we have been investigating do not confine their activity to county borders and will travel across many counties to their crime.'* [12]

Utilisation of 'Non VRM' Intelligence

Databases can now be created to allow a PNCID number to retrieve intelligence in addition to, or in the absence of, a VRM.

The data in the graph below is taken from a live Hertfordshire database, created to identify offenders who are suspected of offences where there is forensic evidence linking them to a crime. This type of information is not placed on the Police National Computer, as the person is only a suspect and not necessarily wanted for the offence.

A 'No VRM' (Central Area Forensic Hit) Database Highlighting the Cross Referencing Initiative



Previous ANPR systems could not use this type of database. Now any intelligence with a PNCID number can be added to National ANPR databases and as a result of using cross referencing software the opportunities for detection and arrest are enhanced.

The team has engineered a paradigm shift. Previously only officers using ANPR equipment could access VRM based intelligence held on the 70+ national databases. As a result of this initiative, any UK police officer, could combine a PNC check with a PNCID cross reference search to access all the national ANPR database intelligence on that person.

Partnership working with the Hertfordshire Court Service has led to a review of systems and recording methods to share non payment of fines data and include VRM and PNCID numbers in court results. Linking the intelligence to ANPR databases will increase execution of the 4200 outstanding non-payment of fine warrants in Hertfordshire. This initiative addresses non payment of fines, a subject of considerable community and government concern.

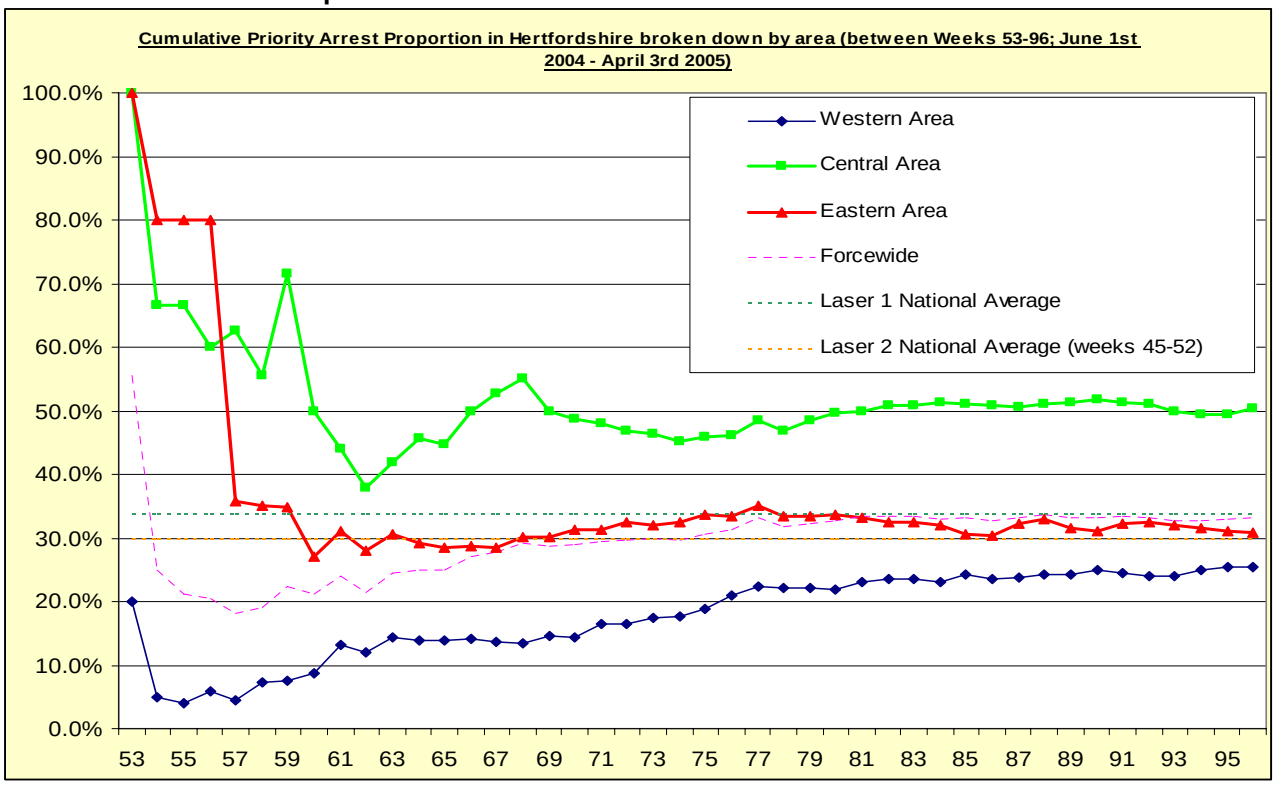
Databases: -

For the last three months all of the three BCU's in Hertfordshire have been including a PNCID number in the ANPR files next to named offenders. There are 98 priority and prolific offenders who have access to motor vehicles.

Intelligence in the Central area shows that 58% of these offenders travel in and use multiple or pool vehicles.

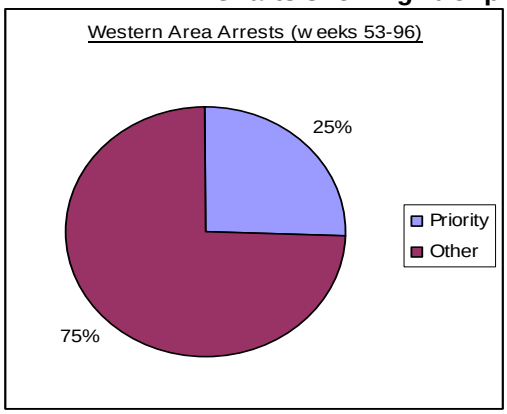
Cross referencing produces better offender profiling and therefore more targeted patrol. This has allowed the team, to be more priority crime offender focussed.

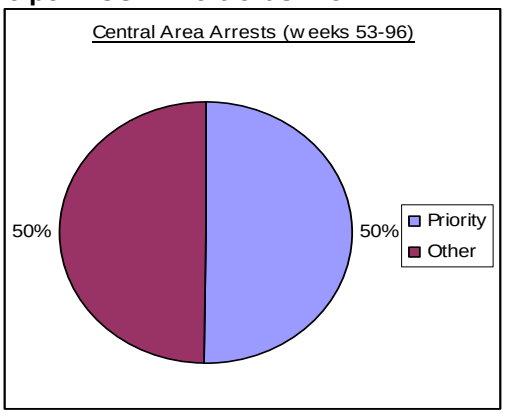
Figures to show cumulative data for priority crime arrest using the national data collection template information for ANPR intercept teams: -

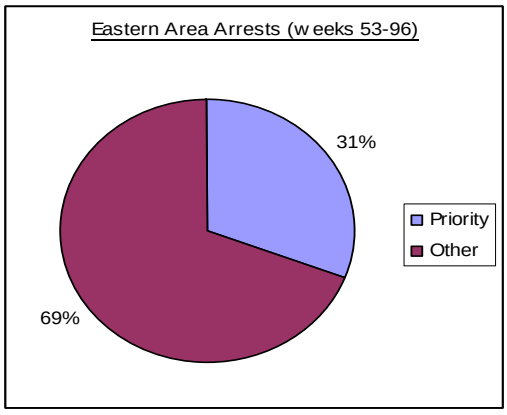


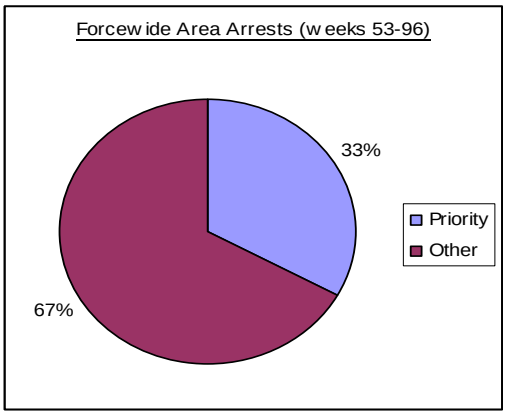
The Central area ANPR team trialling this cross referencing software have a higher proportion of priority crime arrests to the other Hertfordshire teams with 50% of arrests for priority crime offences. This is 19% higher than the National ANPR average.

Charts showing % of priority crime per BCU in Hertfordshire: -

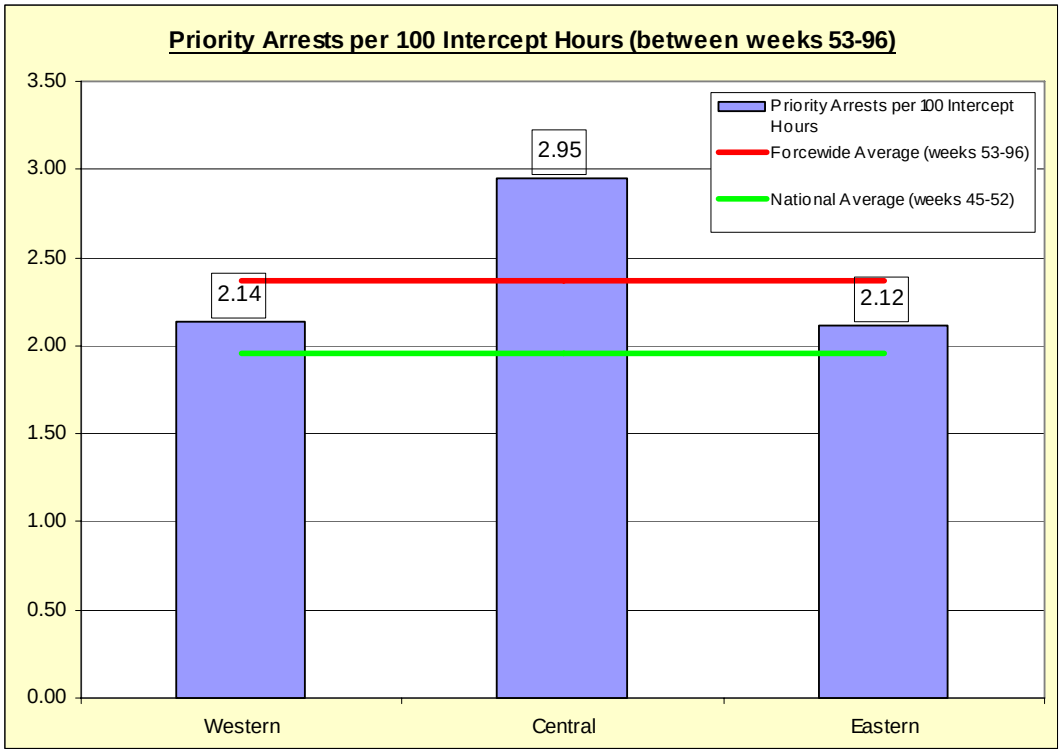








Figures showing comparative data for priority crime arrests based against the National Average



For every hundred hours we work we arrest 2.95 people for a priority crime offence, compared to the National average of 1.99.

Data collected: -

In the last seven months the team has had over 320,000 ANPR camera reads and 5000+ hits. Ongoing analysis shows that 33% of offenders stopped at the roadside have a criminal conviction and have a PNCID number allocated on the Police National Computer. [13]

With the national rollout of BOF2 and the national data warehouse centre later in the year, PNCID cross-referencing will provide an invaluable means of tracking an offender's movements around the country in whatever vehicle they are in.

The Future: -

The introduction of National Identity Cards could make cross-referencing truly international with national identity numbers replacing PNCID in ANPR databases for cross-referencing purposes.

Conclusion

Working with technical partners, the team has ensured that the project has been well managed and complies with all the national data standards.

It is: -

'*Sustainable*' because of its simplicity and ease of implementation.

'*Manageable'* because additional effort required is minimal.

'*Cost effective*' because adjustments to ANPR systems are not expensive.

[1] Hertfordshire Central area statistics
[2] 'Operation Refrain' – Joint Partnership Operation to deter bus crime utilising ANPR.
[3] 7% of ANPR intercept team arrest in Hertfordshire are for section 25 arrests based on identification issues.
[4] Crimereduction.gov.uk – The Prolific and Priority Offender Strategy
[5] Surrounding forces ANPR databases – Thames Valley, Bedfordshire & Metropolitan Police Service
[6] Arrest of a person for a non-arrestable offence where name and address supplied insufficient for service of summons.
[7] 'Focus' edition - highlighting new technology in development in the Police Service.
[8] IMPACT - Information Management, Prioritisation, Analysis, Co-ordination and Tasking
[9] 'Got your number' – Police Review article 08/04/2005 page 24 & 25
[10] Humberside, Northants, Devon & Cornwall, Dyfed Powys, Dorset, W.Midlands, S.Yorks…
[11] 'Engaging criminality – denying criminals use of the roads'
[12] 'Dunstable on Sunday' newspaper report saying 6 offenders arrested for 'conspiracy to steal'
[13] Data collection template Operation Laser