

Back from the battlefield: Domestic drones in the UK

Annexes



Statewatch | www.statewatch.org

Drone Wars UK | www.dronewars.net

Annex 1

Projects funded by the EPSRC

Information in this table is taken from the EPSRC 'Grants on the Web' database.¹

Project	Beneficiaries	Technology Type	Funding (£)
2003			
Modelling and Estimation of Vehicle-Terrain Interactions for Autonomous Unmanned Ground Vehicles	King's College London, J C Bamford Excavators Ltd, QinetiQ Ltd	Ground	322,447
DARP: Unsteady Aerodynamics prediction and Simulation for Airframe and Turbomachinery Applications (PUMA) DARP	University of Surrey, Airbus Operations Ltd, BAE Systems Operations Ltd, QinetiQ Ltd, Rolls-Royce Plc	Aerial	108,234
2004			
An Unmanned Surface Vehicle With Pollutant Tracking And Surveying Capabilities	University of Plymouth, Cattewater Harbour Commission, Devonport Management Ltd, Environment Agency (Exeter), J+S Ltd, QinetiQ Ltd, Reson Offshore Ltd, South West Water Ltd, Tamar Estuaries Consultative Forum, Technical University of Lisbon	Water	250,746
Investigation of Jet/Vortex Interaction	University of Bath	Aerial	163,007
2005			
Decentralised Data and Information Systems	University of Southampton, AMS Ltd	Aerial	5,448,122
2006			
Elastomer Surface Pressure Sensor and its Intergration to a 'Smart' surface for Active Flow Control	Imperial College London	Aerial	777,928
2007			
The Truth about Unmanned Aerial Vehicles	University of Nottingham, Newark Notts & Lincs Air Museum Ltd, QinetiQ (Boscombe Down), Royal Air Force Museum	Public exhibition	68,964
Guaranteed Performance of Dynamic Behaviour of Multiple Unmanned Aerial Vehicles	Imperial College London	Aerial	431,784
AEDUS2: Adaptable Environments for Distributed Ubiquitous Systems	Imperial College London	Unspecified	1,107,871

1. <http://gow.epsrc.ac.uk/NGBODefault.aspx>

Project	Beneficiaries	Technology Type	Funding (£)
2008			
SUAAVE: Sensing Unmanned Autonomous Aerial Vehicles	University College London, BAE Systems Operational Ltd, Boeing Co BT Laboratories, Communications Research Centre Canada, Home Office Science and Development Branch, Thales Research and Technology UK Ltd	Aerial	697,369
Equipment for Multiple Projects: Testing and Visualization for Aerospace Research	University of Bath	Aerial	274,261
WILDSENSING: A Hybrid Framework of Mobile and Sensor Nodes for Wildlife Monitoring	University of Cambridge, INTEL Research, Wavetrend UK Limited	Unspecified	250,335
2009			
Advances in robust control methods and application to flying discs	University of Manchester	Aerial	364,939
Insect wing design: evolution and biomechanics	University of Oxford, Tumbling Dice Ltd, University New South Wales at ADFA, US AirForce Research Lab	Aerial	1,183,660
Nature in Engineering for Monitoring the Oceans (NEMO)	University of Southampton	Water	467,995
2011			
Scalability and robustness in large scale networks and fundamental performance limits	University of Cambridge	Aerial	101,123
Nonlinear Flexibility Effects on Flight Dynamics and Control of Next-Generation Aircraft	University of Liverpool, Airbus UK, BAE Systems, DSTL Portsmouth West, QinetiQ Ltd, University of Liverpool	Aerial	264,622
COLREGs-based Evasive Decision Making in Maritime Vehicles	Queen's University of Belfast	Water	101,323
Embedded vision systems – a platform for integrating modern imaging sensors and real-time image processing	University of Manchester	Unspecified	96,421
Human-agent collectives: from foundations to applications (ORCHID)	University of Southampton, Australian Centre for Field Robotics, BAE Systems, PRI Ltd	Unspecified	5,537,003
2012			
Towards More Autonomy for Unmanned Vehicles: Situational Awareness and Decision Making under Uncertainty	Loughborough University	Unspecified	1,006,188
New Foundational Structures for Engineering Verified multi-UAVs	University of Oxford, George Washington University, IBM UK Labs Ltd, McGill University	Aerial	636,718

Project	Beneficiaries	Technology Type	Funding (£)
Sustained Autonomy through Coupled Plan-based Control and World Modelling with Uncertainty	King's College London	Water	237,002
Machine Learning and Adaptation of Domain Models to Support Real-Time Planning in Autonomous Systems	University of Huddersfield	Unspecified	366,420
2013			
Developing Software for High-Order Simulation of Transient Compressible Flow Phenomena: Application to Design of Unmanned Aerial Vehicles	Imperial College London, BAE Systems, NASA, NVIDIA, Regents of the Uni California Berkeley, Stanford University, Swansea University, University of Utah, Zenotech	Aerial	1,011,005
En-ComE: Energy Harvesting Powered Wireless Monitoring Systems Based on Integrated Smart Composite Structures and Energy-Aware Architecture	University of Exeter, Agusta Westland, BAE Systems, Cranfield University, Defence Science & Tech Lab DSTL, Technology Strategy Board, TRW Conekt, Zartech Ltd	Aerial	630,289
RIVERAS: Robust Integrated Verification of Autonomous Systems	University of Bristol "Private Address"	Unspecified	817,020
Total			£22,722,796

Annex 2

Projects funded by the EU

Information in this table is taken from the EU's CORDIS database.¹

All projects were funded under the Seventh Framework Programme (FP7) except for DESIRE, which was funded under the Sixth Framework Programme (FP6).

Values provided in sterling have been calculated at exchange rates given by XE Currency Converter² on 28 February 2014 and are not intended to represent the value in sterling awarded to projects at the time the grants were made.

Project	UK beneficiaries	Total cost (€/£)	EU funding (€/£)
DARIUS – Deployable SAR integrated chain with Unmanned Systems	BAE Systems (coordinator) Telint RTD Consultancy Services Ltd	10,661,131 / 8,793,307	7,475,830 / 6,195,984
LIVCODE – Life-like visual information processing for robust collision detection	University of Lincoln (coordinator) University of Newcastle	728,500 / 600,859	724,500 / 597,551
HYDROSYS – Advanced spatial tools for on-site environmental monitoring and management	University of Cambridge, Ubisense Ltd (partners)	4,315,691 / 3,559,485	3,260,611 / 2,689,279
CHIROCOPTER – A remote controlled helicopter for investigating the echoes experienced by bat during navigation	University of Bristol (coordinator)	231,283 / 190,757	231,283 / 190,757
MULTITURBULENCE – Fractal-generated fluid flows: new flow concepts, technological innovation and fundamentals	Imperial College (coordinator)	2,317,265 / 1,911,237	2,317,265 / 1,911,237
LOCATE – Locomotion, hunting and habitat utilisation among large African carnivores and their prey	Royal Veterinary College (coordinator)	3,079,643 / 2,539,873	3,079,643 / 2,539,873
HYPHER – Integrated hydrogen power packs for portable and other autonomous applications	Orion Innovations (UK) Ltd (coordinator), University of Glasgow (participant)	3,916,509 / 3,230,250	2,221,798 / 1,832,200
OPARUS – Open architecture for UAV-based surveillance system	BAE Systems (Operations) Ltd, Tony Henley Consulting Ltd (participants), project coordinated by Sagem Defense Securitre (France)	1,405,309 /	1,188,312 / 1,158,947
ULTRA – Unmanned Aerial Systems in European Airspace	Cranfield Aerospace Limited (participants), coordinated by Indra Sistemas S.A. (Spain)	830,576 / 684,969	597,417 / 492,580
ICPUAS – International Cooperation Program for Unmanned Aerial Systems (UAS) Research and Development	Cranfield University (participants), coordinated by Universidad Politecnica de Madrid	Unavailable	70,200 / 57,881
DESIRE – The use of Digital Embedded Systems in Robotics Engineering	University of Kent (coordinator)	40,000 / 32,980	40,000 / 32,980
	Totals	27,525,907 / 22,694,068	21,206,859 / 17,484,252

1. <http://cordis.europa.eu>

2. <http://www.xe.com/ucc>

Annex 3

Freedom of information requests to and responses from police forces

Force	Used drones?	Section 23(5) invoked?	Further information
ACPO London Region			
City of London	No	Yes	
Metropolitan Police	Refusal under sections 23(5), 24(2), 31(3)	Yes	
ACPO Eastern Region			
Bedfordshire	No	Yes	
Cambridgeshire	No	Yes	
Essex	Yes	Yes	<p>“Essex Police does not hold any recorded information relevant to your request. Essex Police has previously responded to FOI requests concerning the use of UAVs or drones with a response which stated that the force owns one such device, although it has never been used in any operational activity.</p> <p>“This device was an ‘air robot’, purchased in 2008 at a cost of £19,015.89 + VAT (reclaimed) and which can best be described as a simple hovering platform upon which camera technology could be mounted. However, the device has not been operational or indeed functional for some years, as considerable alterations; updates and repairs would be required to make it so. It is now no longer considered viable and is to be removed from the Force assets register. As a consequence, Essex Police no longer consider that we currently own such a device, and there are no plans to explore any opportunities in respect of this technology at this time.”</p>
Hertfordshire	No	No	
Norfolk	No	Yes	Have considered use and requested information from companies.
Suffolk	No	Yes	Have considered use and requested information from companies.
ACPO South East Region			
Hampshire	Refusal under section 17(5) (cost)		
Kent	No	Yes	“The position of the Chief Constable is that unmanned aerial vehicles will not be deployed over land falling within his jurisdiction.”
Surrey	No	Yes	
Sussex	Refusal under section 17(5) (cost)		
Thames Valley	No	Yes	
ACPO South West Region			

Force	Used drones?	Section 23(5) invoked?	Further information
Avon and Somerset	Yes	Yes	"Some research and a demonstration" of equipment offered to the force by industry were carried out.
Devon and Cornwall	No	Yes	
Dorset	No	Yes	"Dorset police have previously considered using UAVs" - "Our enquiries indicate that grant of £10,000 was received from the Home Office, but subsequently returned to them unused."
Gloucestershire	No	No	"The legislation makes it disproportionately expensive for this force" - "There have been no meetings [with private companies], but UAV's have been demonstrated to the force at large training events."
Wiltshire	No	Yes	"Wiltshire police makes use of the force helicopter therefore a UAV has not been considered."
ACPO East Midlands Region			
Derbyshire	Yes	Yes	"The Constabulary did utilise a UAV on 15 August 2009 to assist in the monitoring of the Red, White and Blue Festival at Codnor. The UAV was a Model ARB 100b manufactured by Air Robot UK. The intention was to 'test' the concept but due to technical issues on the day and the fact it was a large scale operation the use of the Constabulary's helicopter was more effective. Given the above circumstances no policy was drafted covering its use or the collection/ use of any data recorded. As such the position of the Constabulary in respect of this is 'no information held.' "I am able to state however, that at the time of use relevant guidance as issued by the Civil Aviation Authority was utilised."
Leicestershire	No	No	
Lincolnshire	No	Yes	
Northamptonshire	No	Yes	
Nottinghamshire	No	Yes	
ACPO West Midlands Region			
Staffordshire	Yes	Yes	"All data that is gathered by Staffordshire Police is subject to the Data Protection Act, MOPI [Management of Police Information] and RIPA."
Warwickshire	No	Yes	
West Mercia	No	Yes	
West Midlands	Yes	Yes	"From memory, one officer is aware that a blimp was used at the Warwickshire Cricket ground in 2007. The UAV in question was used by the cricket ground and we had access to the live images in their control room. "We also believe that we may have utilised a blimp for the Birmingham (Handsworth) Carnival about five years ago, possibly the 2009 Carnival. However we do not have any documentation to support this and the officer who would have been in charge at the time has since retired."
ACPO North East Region			
Cleveland	No	Yes	
Durham	No	Yes	
Humberside	No	Yes	Drones are "not fit for our purpose."
North Yorkshire	No	Yes	
Northumbria	No	Yes	

Force	Used drones?	Section 23(5) invoked?	Further information
South Yorkshire	No	Yes	
West Yorkshire	Refusal under sections 23(5) and 31(3)	Yes	
ACPO North West Region			
Cheshire	No	Yes	
Cumbria	No	Yes	
Greater Manchester	No	Yes	
Merseyside	Yes	No	Request asked for details on data retention and use policy: "No information held. Merseyside Police has not operated drone since February 2010. The team who operated the drone have since moved and the documentation relating to this subject is therefore limited."
Lancashire	No	Yes	
Police Service of Northern Ireland	Refusal under section 12(1) (cost)		"I have been informed that in excess of 20 staff were involved in contacts with various UAV manufacturers and details of these contacts are held by the individuals involved."
ACPO Wales Region			
Dyfed Powys	Yes	Yes	A "scoping exercise" that ran from 2009 to 2010 involved a visit to Air Robot at National Defence College 26 October 2009; and "a UAV was borrowed/ loaned from a company and deployed in the early stages of Operation Tempest (search for April Jones) in October 2012 [from] 3rd-5th October 2012" in order "to conduct aerial photography of a search area" but "the make and manufacturer of the UAV is not known."
Gwent	No	Yes	
North Wales	No	Yes	"The recent national review of air operation in the UK recommended that the use of UAVs should be considered from a centralised perspective. Consequently the National Police Air Service (NPAS) has been formed and North Wales Police would look to NPAS to take the lead on such matters."
South Wales	No	No	"The use of UAVs is currently being looked at by the NPAS."
Scotland			
Police Scotland	No	No	"I can, however, advise that between 2007 and 2008 Strathclyde Police undertook a trial of an Unmanned Airborne Vehicle (UAV) for approximately 12 months in the more remote and inaccessible Argyll area. The UAV was used for Search and Rescue purposes and for this purpose only and on the termination of the trial the piece of equipment was returned to the manufacturer."
Non-geographic forces			
British Transport Police	Yes	Yes	"British Transport Police took part in a trial of unmanned aerial vehicles approximately 3-4 years ago. The Officer who dealt with this trial has now left British Transport Police and there is no paperwork held in relation to it."
Central Motorway Policing Group	No application made		
Civil Nuclear Constabulary	Yes		"Yes – considered only."
Ministry of Defence Police	No application made		
National Police Air Service	No	Yes	

Force	Used drones?	Section 23(5) invoked?	Further information
Port of Dover	No (financially unviable)	No	"It is not envisaged that the Port of Dover Police will investigate the level of criminality may necessitate the use of an UAV and the subsequent costs would make the available of a UAV financially unviable."
Port of Liverpool	FOI Act does not apply		
SOCA	FOI Act does not apply		
ACPO (England & Wales)	No	Yes	

Annex 4

ACLU recommendations for government use of drones in the USA

The following recommendations were first published in the American Civil Liberties Union report 'Protecting Privacy From Aerial Surveillance: Recommendations for Government Use of Drone Aircraft', written by Jay Stanley and Catherine Crump and published in December 2011.¹ Although they are not directly applicable to the UK, they provide a useful starting point for considering meaningful regulation of domestic drone use.

ACLU recommendations

UAVs are potentially extremely powerful surveillance tools, and that power, like all government power, needs to be subject to checks and balances. Like any tool, UAVs have the potential to be used for good or ill. If we can set some good privacy ground rules, our society can enjoy the benefits of this technology without having to worry about its darker potentials. We impose regulations on what law enforcement can do all the time, for example allowing law enforcement to take a thermal image of someone's home only when they get a warrant. We need to impose rules, limits and regulations on UAVs as well in order to preserve the privacy Americans have always expected and enjoyed.

The ACLU recommends at a minimum the

following core measures be enacted to ensure that this happens:

Usage restrictions

UAVs should be subject to strict regulation to ensure that their use does not eviscerate the privacy that Americans have traditionally enjoyed and rightly expect. Innocent Americans should not have to worry that their activities will be scrutinized by drones. To this end, the use of drones should be prohibited for indiscriminate mass surveillance, for example, or for spying based on First Amendment-protected activities [freedom of religion, of speech, of the press, of peaceful assembly, to petition government]. In general, drones should not be deployed except:

- where there are specific and articulable grounds to believe that the drone will collect evidence relating to a specific instance of criminal wrongdoing or, if the drone will intrude upon reasonable expectations of privacy, where the government has obtained a warrant based on probable cause; or
- where there is a geographically confined, time-limited emergency situation in which particular individuals' lives are at risk, such as a fire, hostage crisis, or person lost in the wilderness; or
- for reasonable non-law enforcement purposes by non-law enforcement agencies, where privacy will

1. <http://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf>

not be substantially affected, such as geological inspections or environmental surveys, and where the surveillance will not be used for secondary law enforcement purposes.

Image retention restrictions

Images of identifiable individuals captured by aerial surveillance technologies should not be retained or shared unless there is reasonable suspicion that the images contain evidence of criminal activity or are relevant to an ongoing investigation or pending criminal trial.

Public notice

The policies and procedures for the use of aerial surveillance technologies should be explicit and written, and should be made public. While it is legitimate for the police to keep the details of particular investigations confidential, policy decisions regarding overall deployment policies – including the privacy tradeoffs they may entail – are a public matter that should be openly discussed.

Democratic control

Deployment and policy decisions surrounding UAVs should be democratically decided based on open information – not made on the fly by police departments simply by virtue of federal grants or other autonomous purchasing decisions or departmental policy fiat.

Auditing and effectiveness tracking

Investments in UAVs should not be made without a clear, systematic examination of the costs and benefits involved. And if aerial surveillance technology is deployed, independent audits should be put in place to track the use of UAVs by government, so that citizens and other watchdogs can tell generally how and how often they are being used, whether the original rationale for their deployment is holding up, whether they represent a worthwhile public expenditure, and whether they are being used for improper or expanded purposes.