ACPO Operational Requirement for UAS

Alan Brooke

Centre for Applied Science and Technology
Existing air support

- Mostly light twin helicopters EC135 / MD902
- Pilot, observer, radio operator, commander
- Stabilised camera turret Wescam / FLIR
- Colour, LW or MW thermal cameras, Near IR
- Hull may be bought or leased, employed or hired pilots, in house or contracted maintenance
- Intelligence gathering, crime response, misper search, security sweep, major events
- Highly visible asset – calming or worrying?
Cost and effectiveness

Now
- Total spend around £65 million
- 30 Units operating 33 aircraft

Soon
- National Police Aviation Service
- Providing better cover
- Concentrating on high usage areas
- Relocating some units
- Reducing number of aircraft
- Saving £12-15 million
Potential for ‘fill in’ capability supplied by UAS

- Existing assets expensive to own, maintain and operate.
  - Limits on use due to running costs
  - Nil risk operations only
- For some tasks they are not cost effective
- Some areas are difficult to cover (high ground and low cloud)
Operating scenarios

2 areas of interest in UAS:

South Coast Partnership – persistent reconnaissance in shared airspace, high autonomy of image gathering and interpretation.

Operational support – usually close range, usually short duration, low altitude.
ACPO Statement of Requirement...

- Unassisted take off and recovery
- Automatic tracking of operator – orbit or hover above
- Auto return to last known operator location on comms loss
- Live video downlinked to operator
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- UAV height AGL displayed on base station
- Lat/long and grid reference of UAV
- Geo-referenced point of view
ACPO Statement of Requirement...

- Unassisted take off and recovery
- Automatic tracking of operator – orbit or hover above
- Auto return to last known operator location on comms loss
- Live video downlinked to operator
- Lat/long and grid reference of centre of field of view
- Height AGL displayed on base station
- Geo-referenced point of view
- Ground station must not impair operators peripheral vision (e.g. no light hood or goggles)
...ACPO Statement of Requirement...

- Wind up to 25kts
- Light precipitation >6oC, dry >=-6oC
- 40 minutes duration
- Under 5 minutes turnaround for battery swap
- Fitted with microphone
- Rotor / propeller strike prevention
...ACPO Statement of Requirement...

- Colour camera with 25x zoom and thermal camera
- Camera PTZ independent of flight direction
- Camera must have
  - Auto target tracking
  - Geo-referencing
  - Flight pattern controlled by camera operation
- Digital video recording on board
  - Must record total flight duration
  - No moving parts (preferably)
  - Must survive FIT
  - Hot swappable (when power pack changed)
  - Encrypted recording
ACPO Statement of Requirement

- Send GPS location when on ground
- Location bleep and flash on demand
- Will pack into estate car or car derived van
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- Waterproof!
The important bits

- Continual recording – no gaps in evidence
- Optical quality – spatial resolution AND stabilisation
- Geo referencing of viewpoint
- Target tracking, camera and UAV
- Should carry all payloads – not return to base to exchange
- Autonomously operate in urban environment clutter – houses, trees, power / phone lines
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  - Auto landing system – deep stall, drogue, controlled descent rate...
- Minimal training or experience requirement
Police trials thus far

- Overly optimistic expectations
- No specific goals for the trials
- Limited effectiveness
- Ambition has been limited by low capability of systems
- Used as camera on a stick (without the stick)
- Imagery not really adequate within CAP 722 limits
  - i.e. more than 50m away
What could we do?

- Remote sensor deployment for dirty / dangerous environments
  - Carry a sensor
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  – Carry a sensor
  – Be the swab
Decontamination options
What could we do?

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– Perch and stare
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- Remote sensor deployment for dirty / dangerous environments
  - Carry a sensor
  - Be a swab
- Perch and stare
- Loudhailer for delivering messages
- Incident / crime scene recording
- Automated change detection
- ‘Rural’ crimes, metal or plant theft, poaching, wildlife crime
Demonstration of design and build competence

- System design accreditation
- Construction standards and testing
- Control software standards and testing
- Maintenance schedules
- Field repair vs. RTB
- Change control
In-house or bought in service?

- Manned aircraft are delivered to site by contract pilot
- UAV could be operated similarly

- Observer or radio operator need not be in aircraft
  - More that one pair of eyes allows multiple target tracking
  - Situational awareness could be reduced
  - ‘Dummy look’ with searchlight
Observations on the UAS world

– Often trying to be small copies of aircraft
  – Non conventional construction methods and materials
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  - Non conventional construction methods and materials
- Designs driven by manned requirements
- Fuel efficiency, speed and range are not major needs
- High drag, high lift may be an option

- Stability is desirable
Revisit older aircraft designs

- Designs were limited by materials and power
  - Long rigid wings could not be built
- Multi wing
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– Wing warping - we can make them flexible so why not use the attribute?
  – Reduced linkage complexity
  – Reduced drag
– What do we want a fuselage for?

– If we don’t need speed...
Assumptions?

- Beyond line of sight = sharing congested airspace
  - Don’t necessarily need to be above 400 feet AGL even at range
- Why should the operator have to take over and fly UAV?
  - Safe landing mode could be invoked to prevent a crash
- Why train operators on airframe type?
  - Train them to use the control system
  - Single flight control system and selection of modular airframes
  - Select appropriate airframe for the task
In Summary

- Police UAS need to augment existing manned fleet, not compete with it.
- Identify areas of opportunity:
  - Dirty tasks
  - Dangerous tasks
  - Manned flights too expensive
  - Discretion required
- Long range and endurance may not be critical factors
- Quality of imagery is important
- Most operations likely to remain within CAP 722 limits