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ACPO Operational Requirement for UAS

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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*

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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...

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- *Automatic tracking of operator – orbit or hover above*
- *Auto return to last known operator location on comms loss*
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- *UAV height AGL displayed on base station*
- *Lat/long and grid reference of UAV*
- *Geo-referenced point of view*

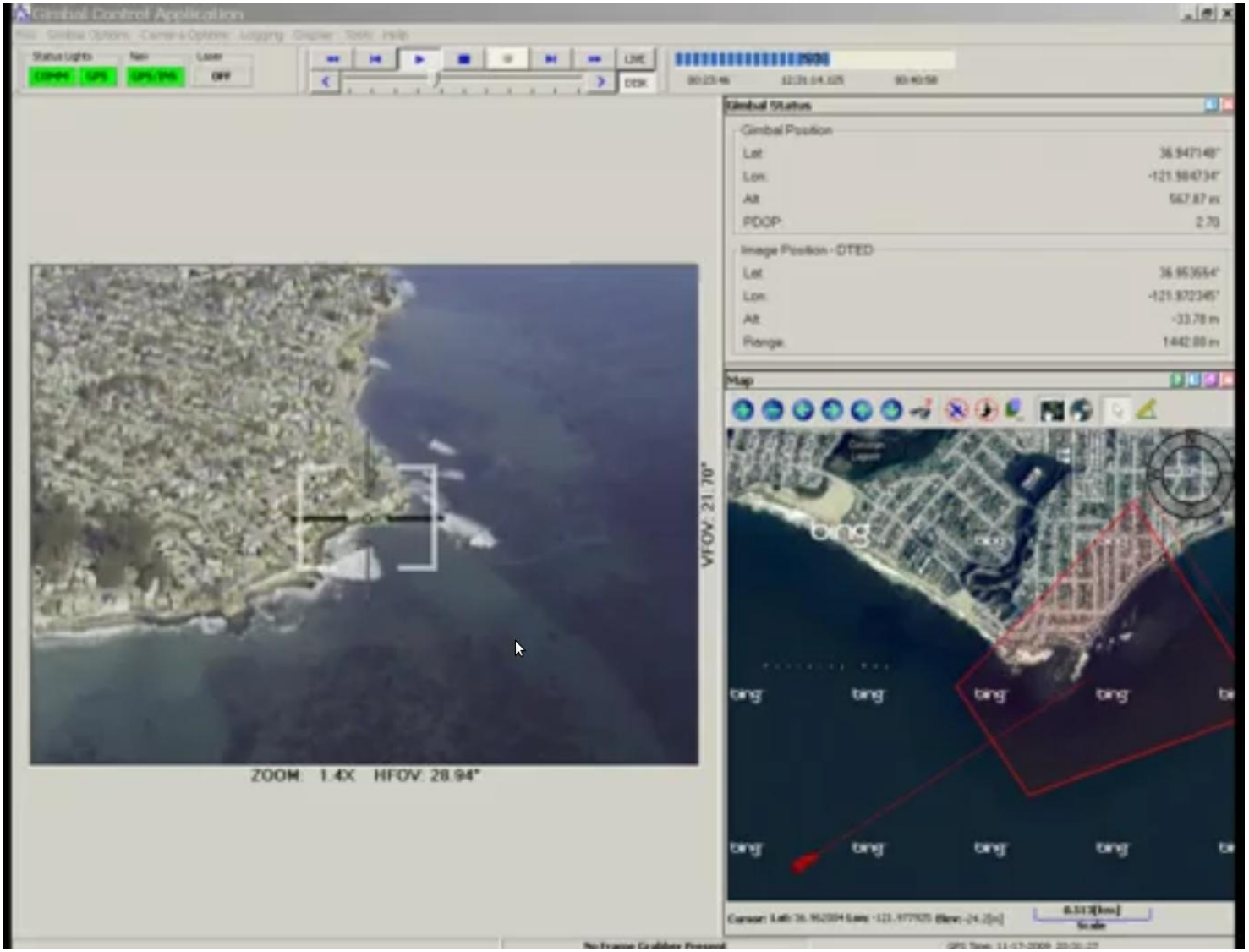

Image courtesy of Cloud cap Technologies

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- *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)*

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...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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- *Air vehicle less than 7kg*

- *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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Decontamination options

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- 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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Observations on the UAS world

- Often trying to be small copies of aircraft
  - 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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- Designs were limited by materials and power
  - Long rigid wings could not be built
- Multi wing
- 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...

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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

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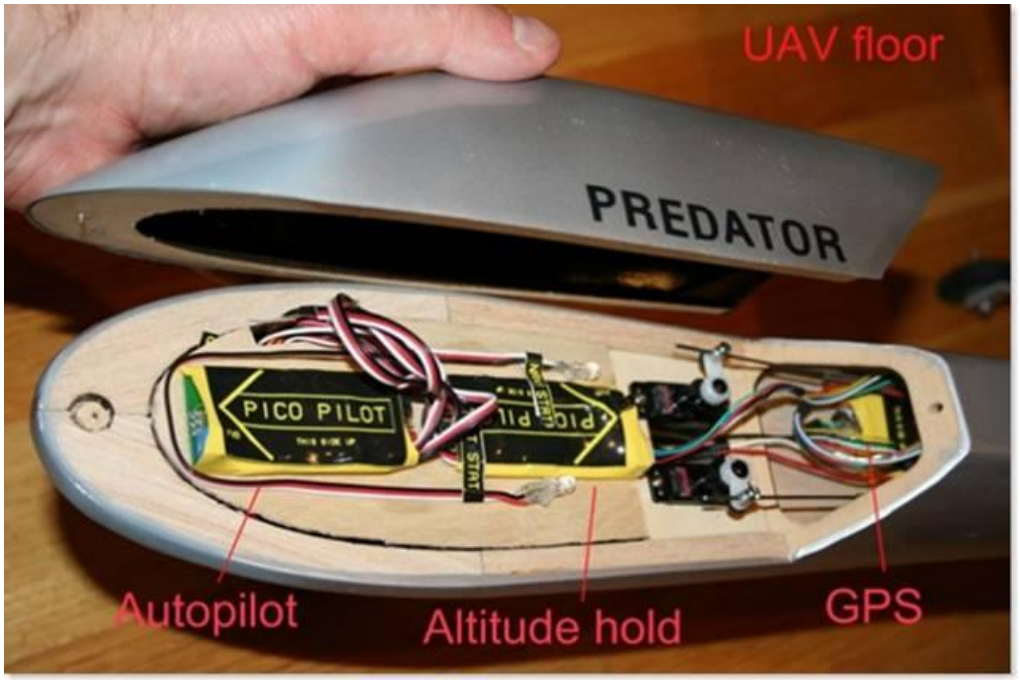

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