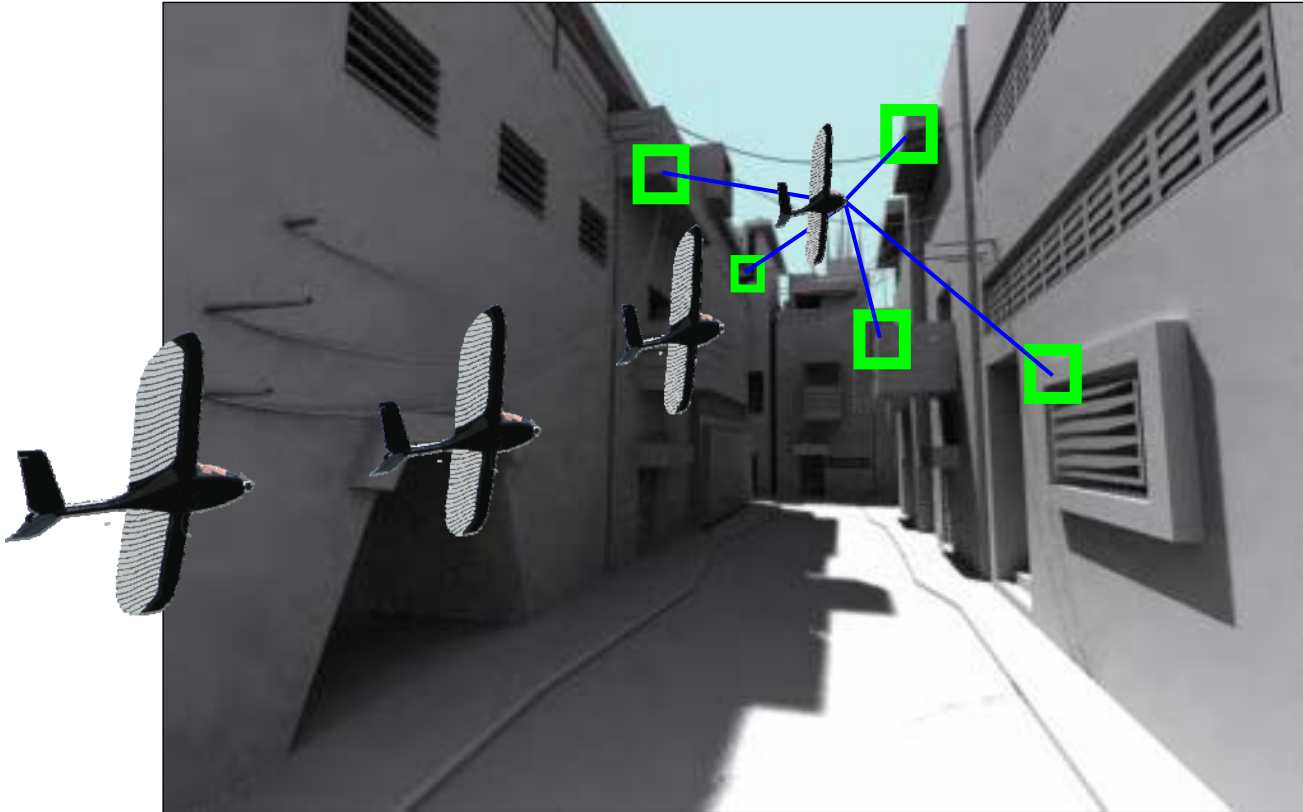




# Supervised Autonomy: A Few Thoughts



*Agile Autonomous Flight*

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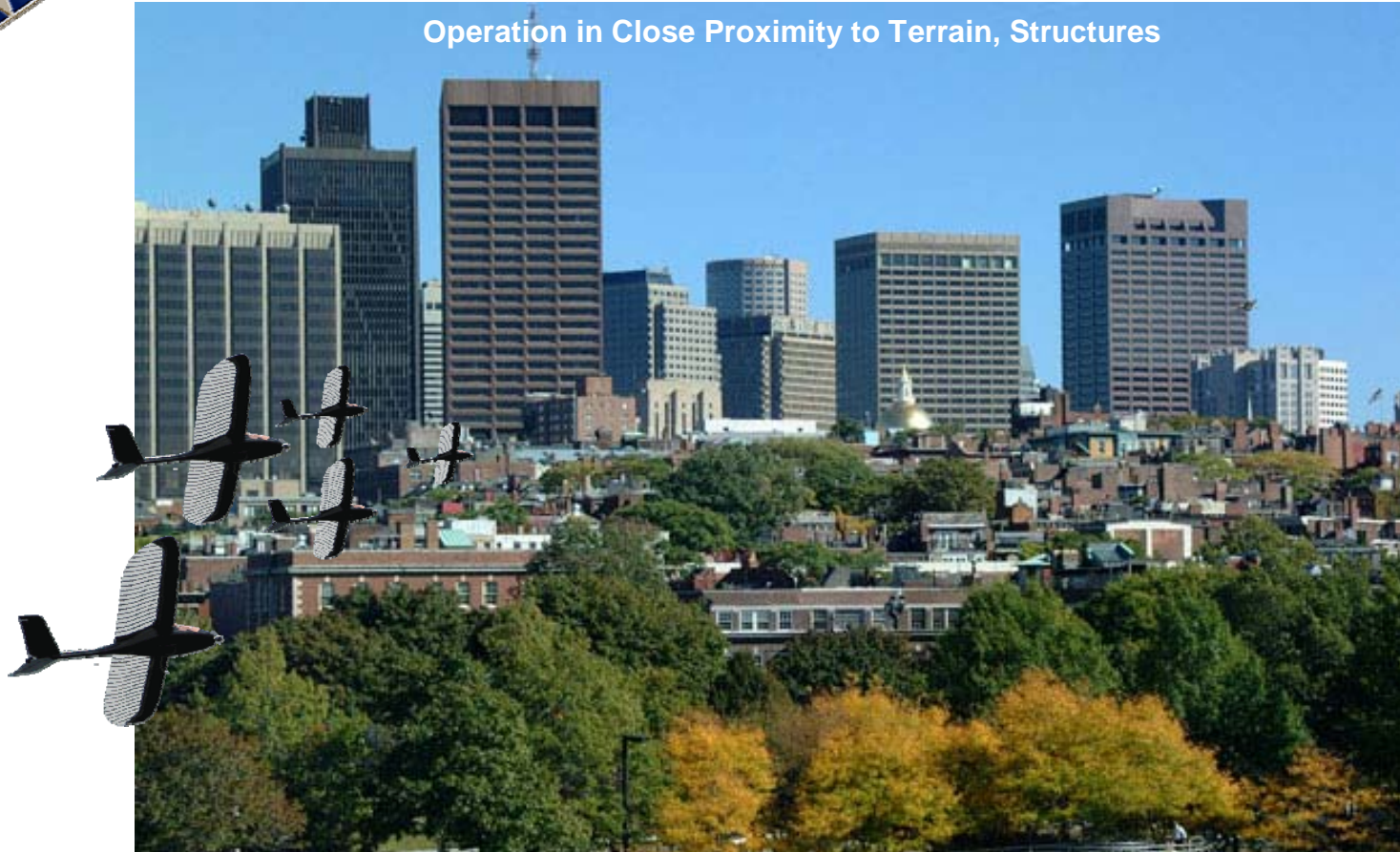
[johnny.evers@eglin.af.mil](mailto:johnny.evers@eglin.af.mil)



# Why Autonomy?

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Operation in Close Proximity to Terrain, Structures



## ***Fundamental issues:***

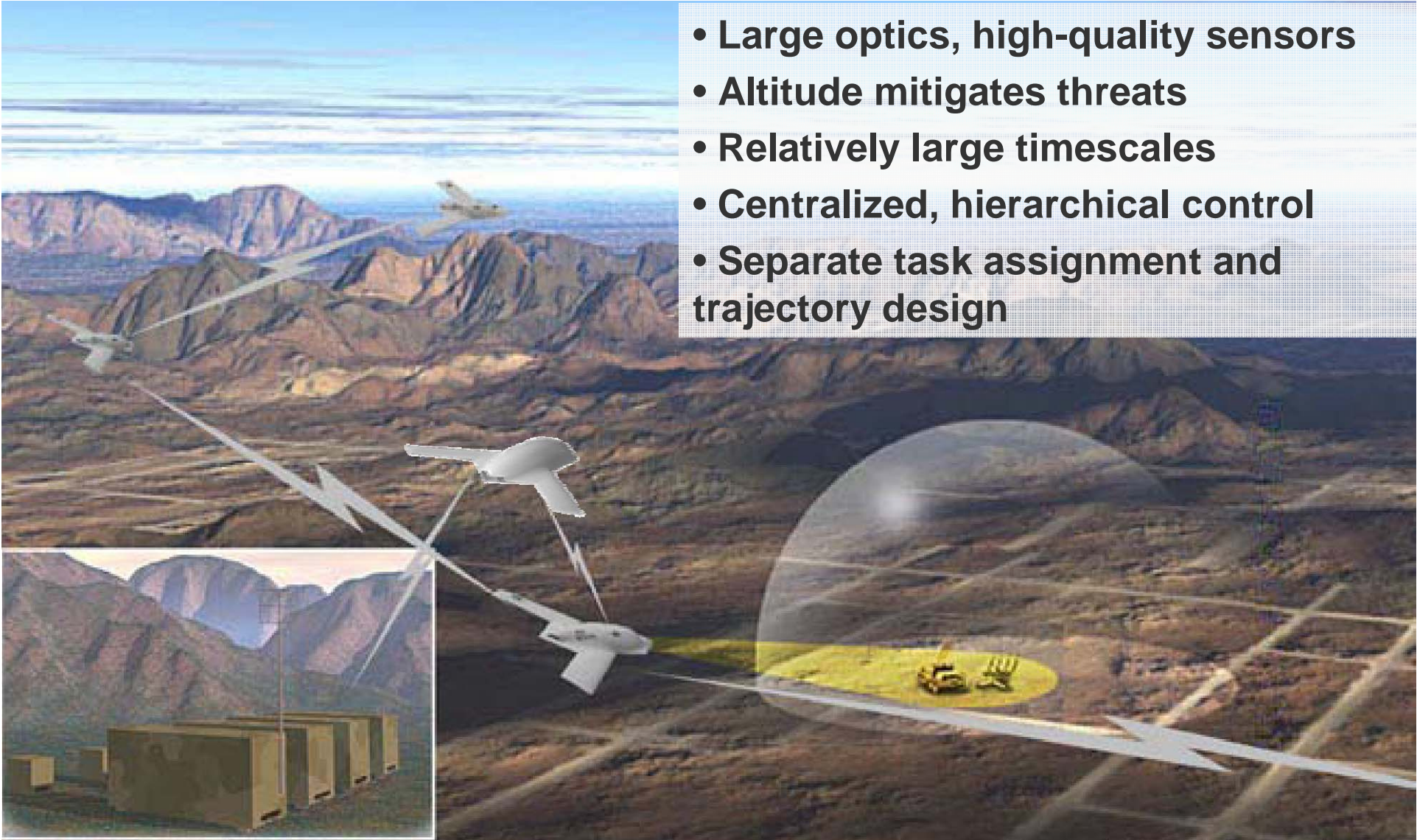
- ***How to find and prosecute targets in hostile, obstacle cluttered environments***
- ***What are appropriate roles for human operators? For aerial robots?***



# Tactical UAVs

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- Large optics, high-quality sensors
- Altitude mitigates threats
- Relatively large timescales
- Centralized, hierarchical control
- Separate task assignment and trajectory design

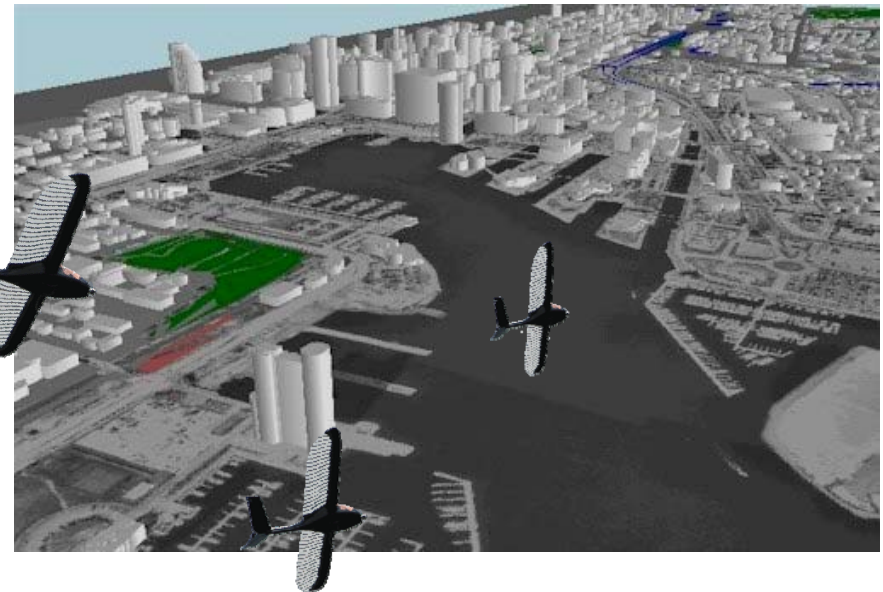
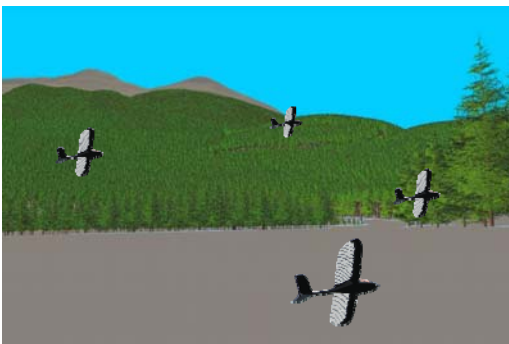




# Munitions & MAVs

Munitions Directorate

- Time critical targets
- Non-typical targets – at best, ATA cues ‘class’ of potential targets → requires human
- Small optics, low-quality sensors
- Decentralized communication, unique objectives → distributed control
- High threat environment
- Robust search
- Small timescales





# Supervised Autonomy

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## *Integrating Humans Into Time Critical Autonomous Systems*

### *Time Criticality*

- Human supervision – effects of human response latency must be mitigated → stability, robustness, performance
- Insight, not just oversight – humans add value (e.g., situational awareness, judgement)

### *Context Appropriate Information Processing*

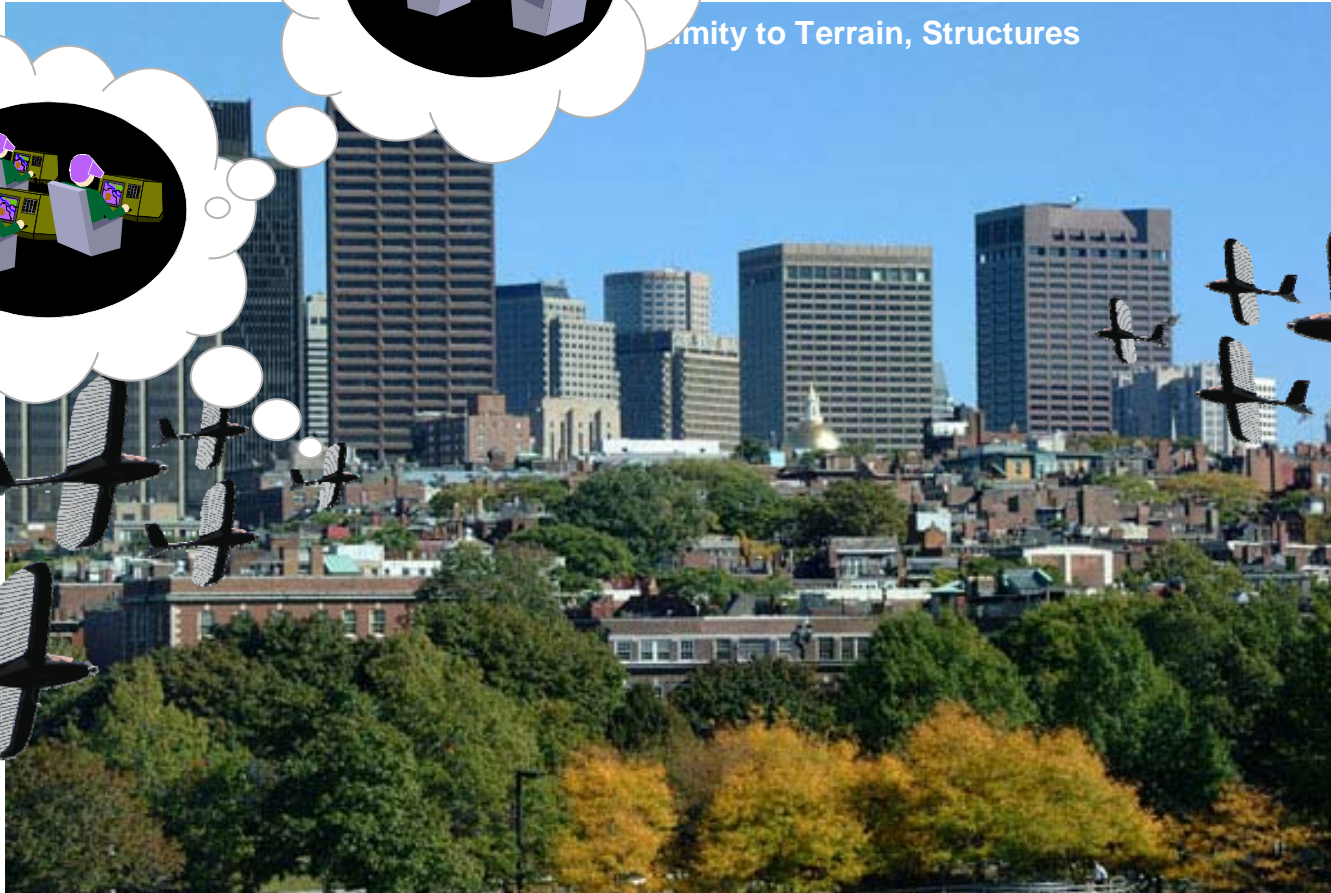
- Information conveyed in appropriate context, at level of “cognition” required for decision
  - Operators must appreciate machine state at the “appropriate level” to make insightful decisions – *machines supply correct information in context of situation*
  - Machines must respond appropriately to operator decision processes in context of current situation and level of operator effectiveness – *humans must supply (overtly or not) sufficient and timely information*



# Supervised Cooperative Autonomy

Munitions Directorate

Proximity to Terrain, Structures



***This is a multi-scale dynamics & control problem:***

- ***Humans are observers, exogenous dynamics, controllers, ...***
- ***Humans impact system / subsystem stability, robustness, fragility, ...***



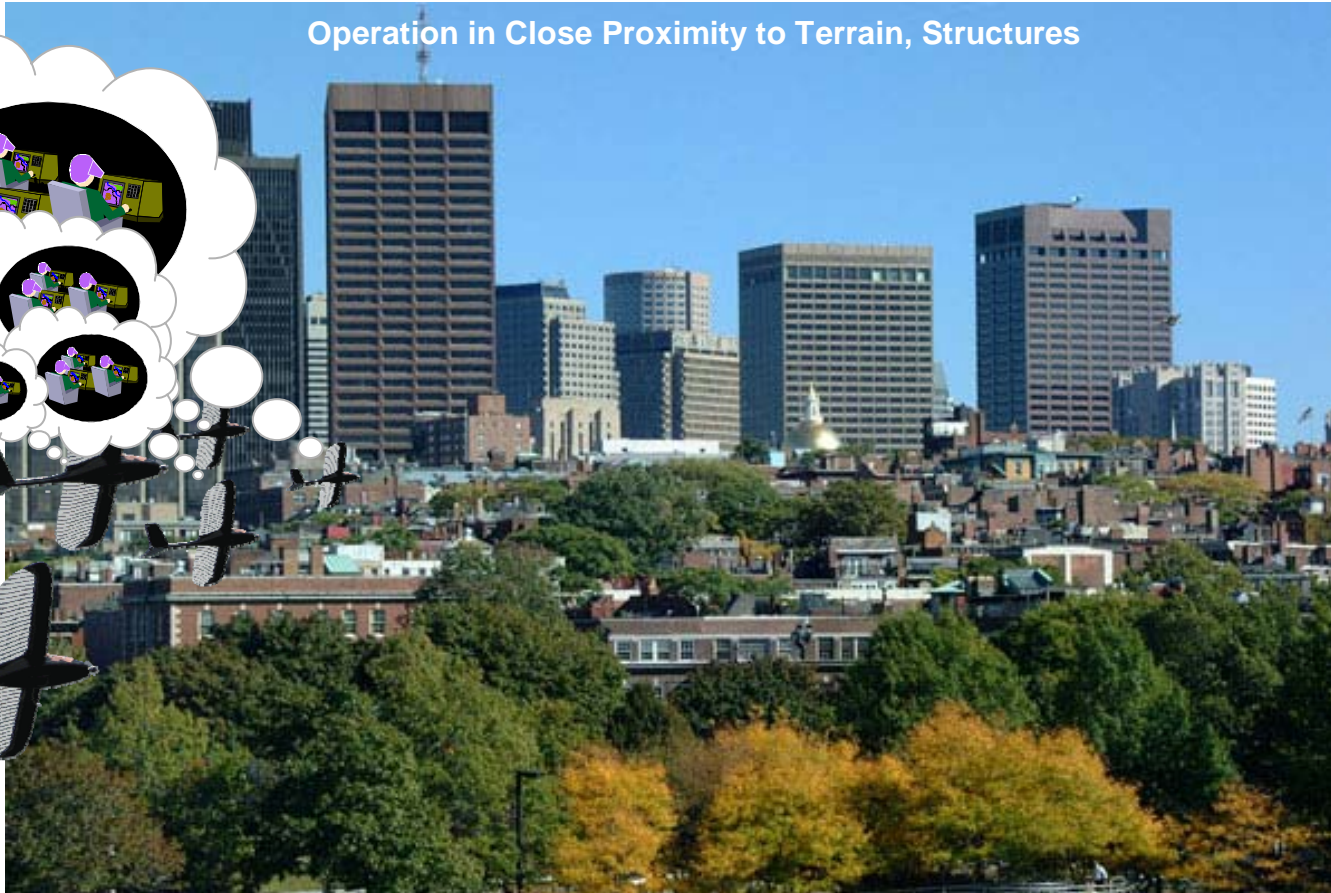
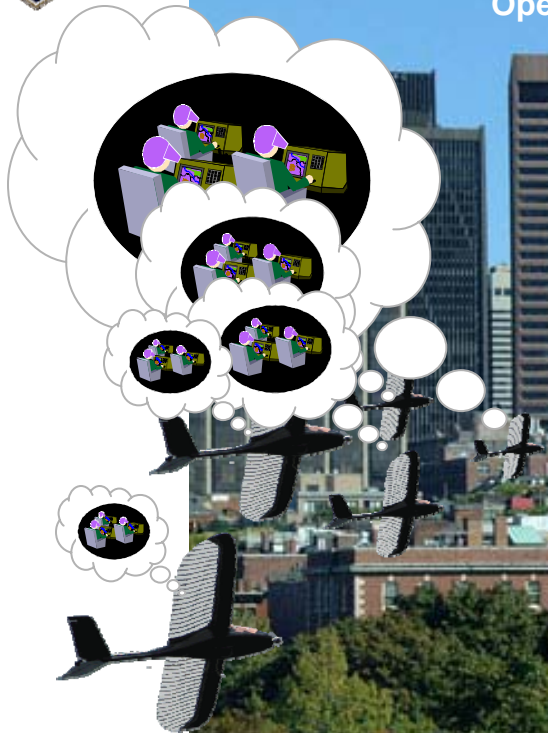
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# Supervised Cooperative Autonomy

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Operation in Close Proximity to Terrain, Structures



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