Airborne Artificial Intelligence in the Wild - Easy, Hard, or Impossible?

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- Rolls-Royce 1989-97
- STMicroelectronics 1997-2000
- Airbus 2001-2014
- University of Bristol 2006-2009
- University of West of England 2014-

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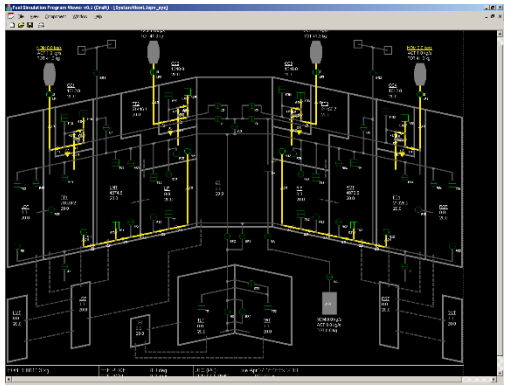
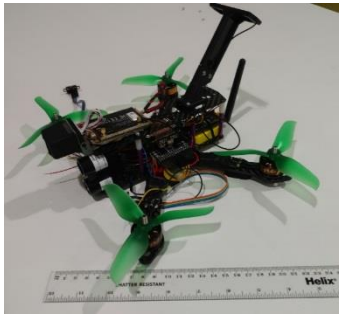


UWE drone activities

- Demonstrators in TRL 4-6
- MAAXX Robot Air Racing

[dstl]

- "Safety Argument for AI Autonomous Systems" (DSTL)



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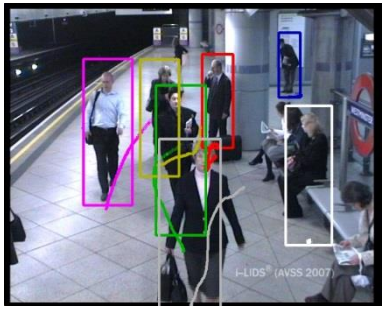
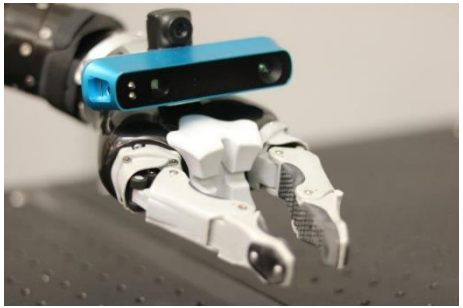
What is Artificial Intelligence?

Computer systems able to perform tasks normally requiring human intelligence

- Visual perception
- Dexterous manipulation
- Verbal communication
- Decision-making





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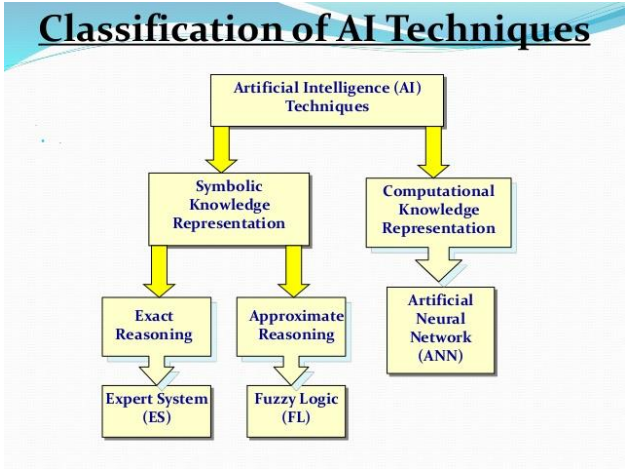
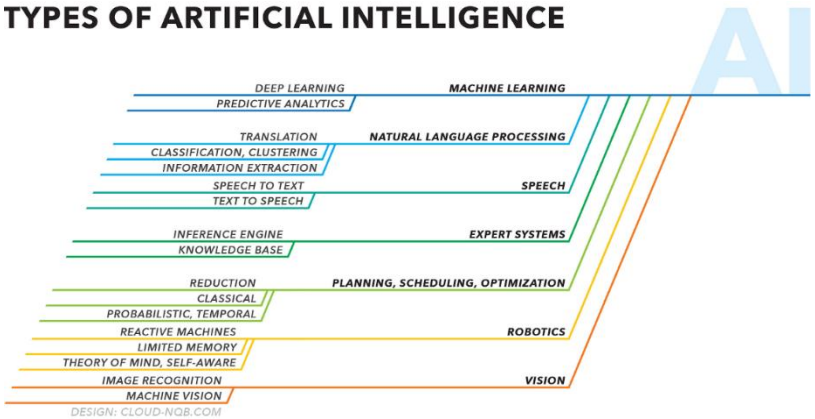
Which AI?

- AI is a *massive* subject
- Rule of thumb (for now) – real-time operation with little/no on-line training
- i.e. deployable soon





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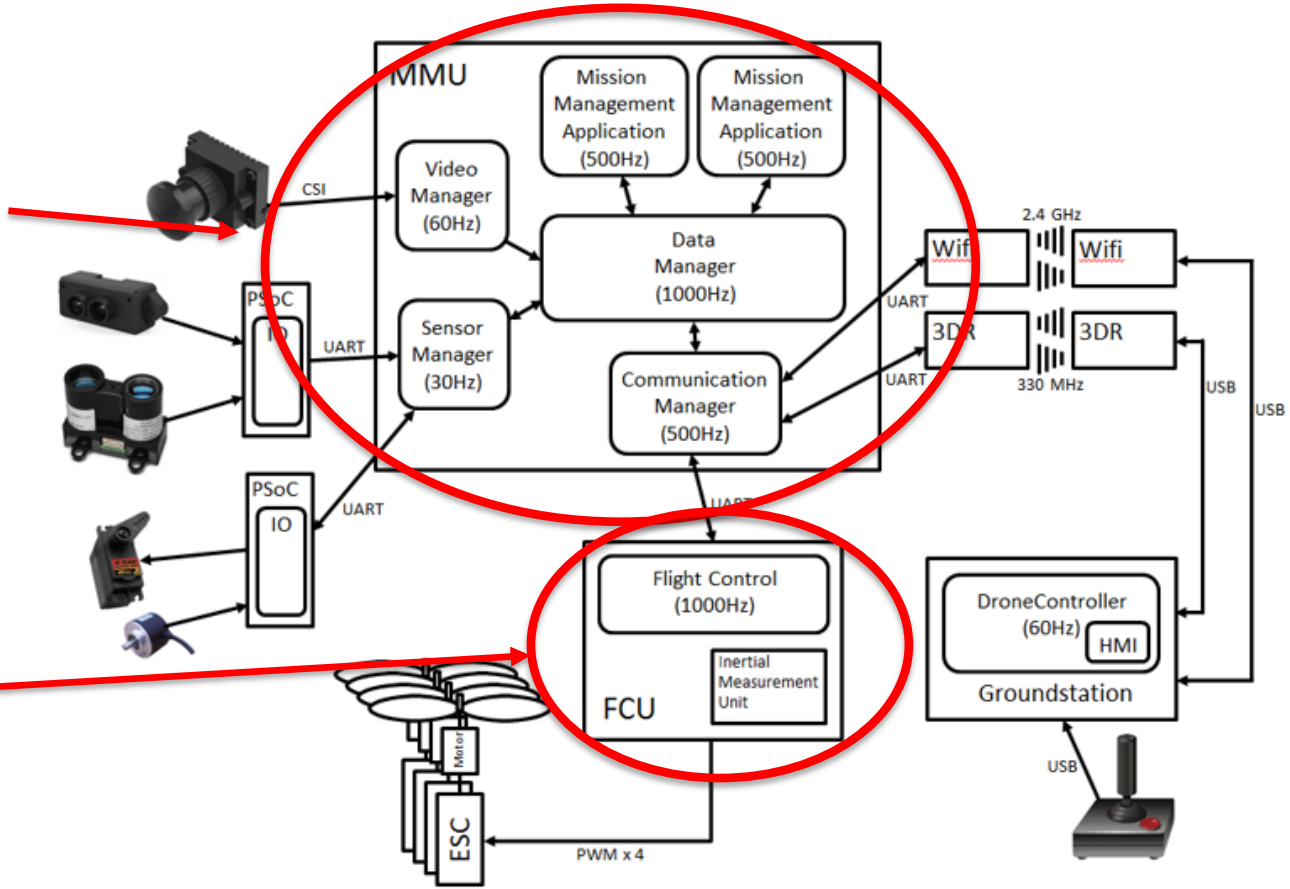
AI for Navigation/Mission Management

Mission Management Unit

Flight Control Unit



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Navigation/Mission roadmap

Close-in interaction and inspection

- Public spaces
- Harbours
- Airports
- Battlefields

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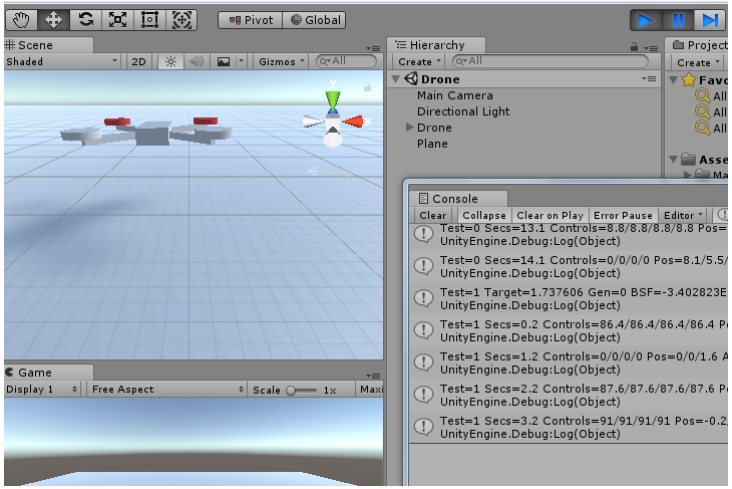
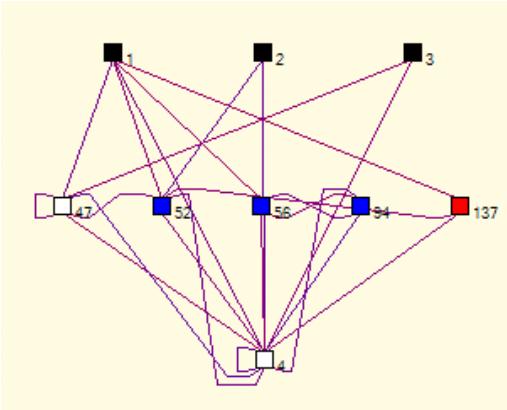
AI for Control

- Flight Control
- Models +

Genetic Algorithms

= Neural Nets





- Artificial *Instinct*

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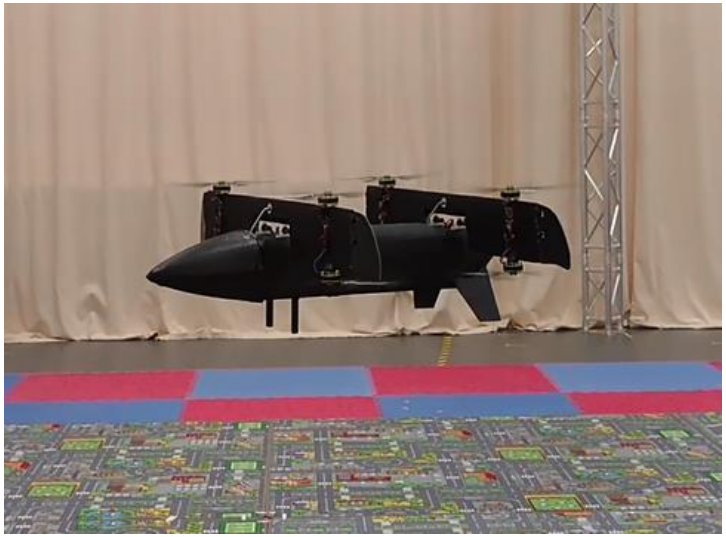
AI for Control

- Future airframes



"MBDA Spectre"

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The Challenges - Reliability

- Availability (does what we want)

- Integrity (doesn't do what we don't want)

The AI Challenge is one of *Integrity*

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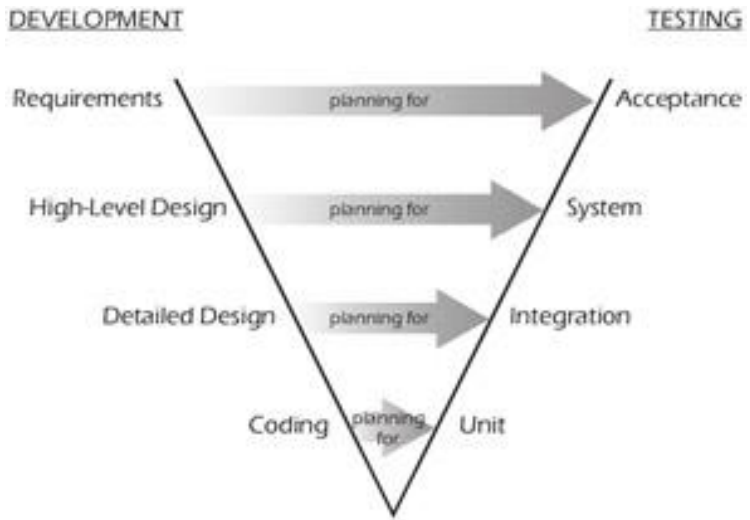
Conventional Solutions

- Certification
- Processes - DO178C etc.
- Architectures



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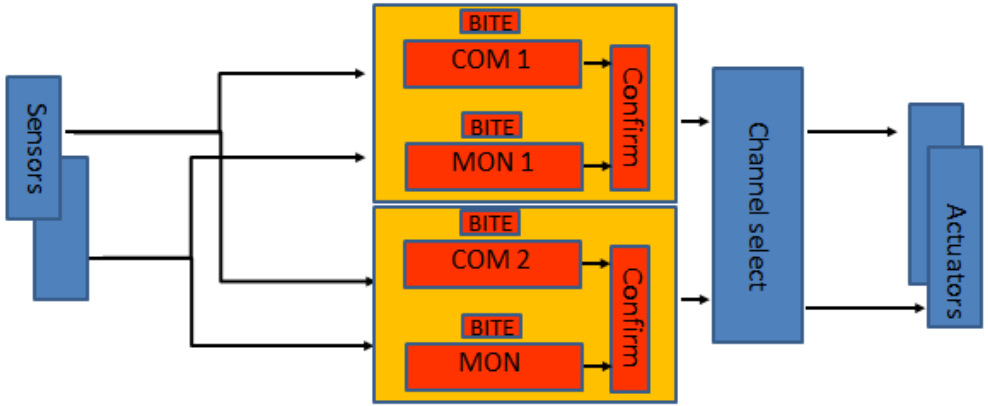
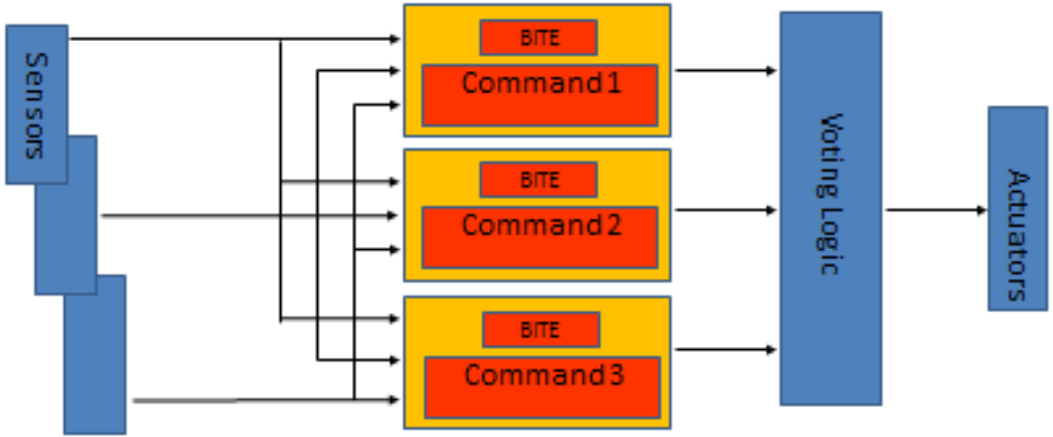
Conventional Reliable Avionics



- High Availability
- High Integrity



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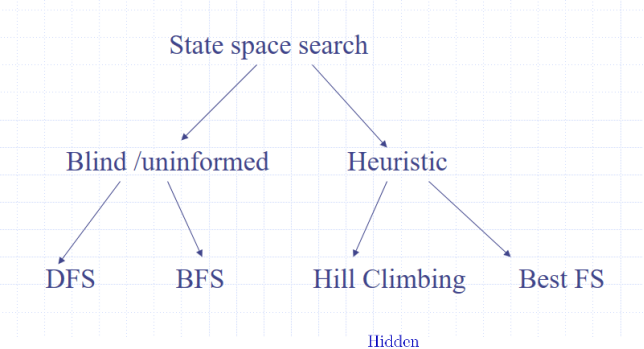
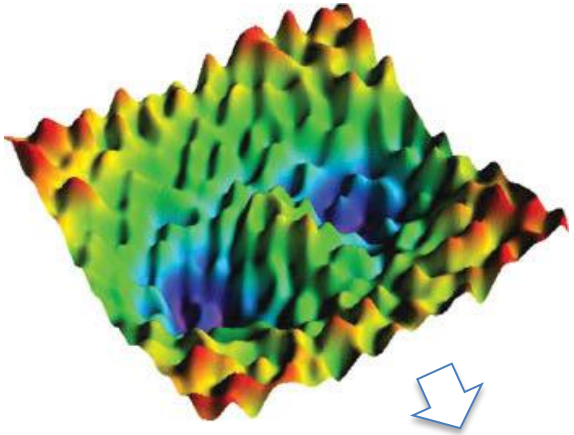
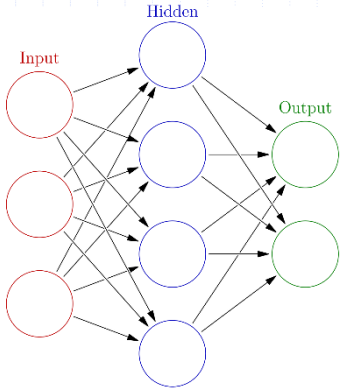
Solutions – Certified AI?

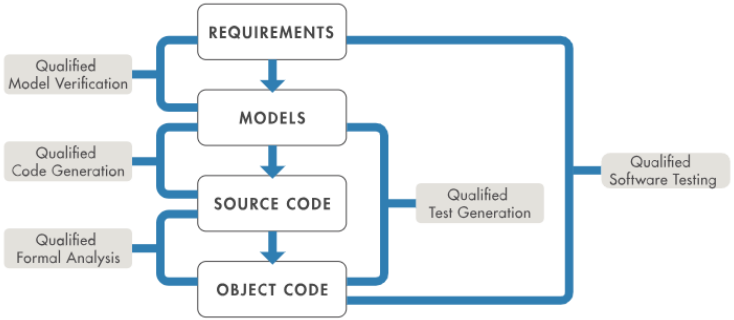
- Certification of AI for *Integrity* looks a long way off

  …but we are on it









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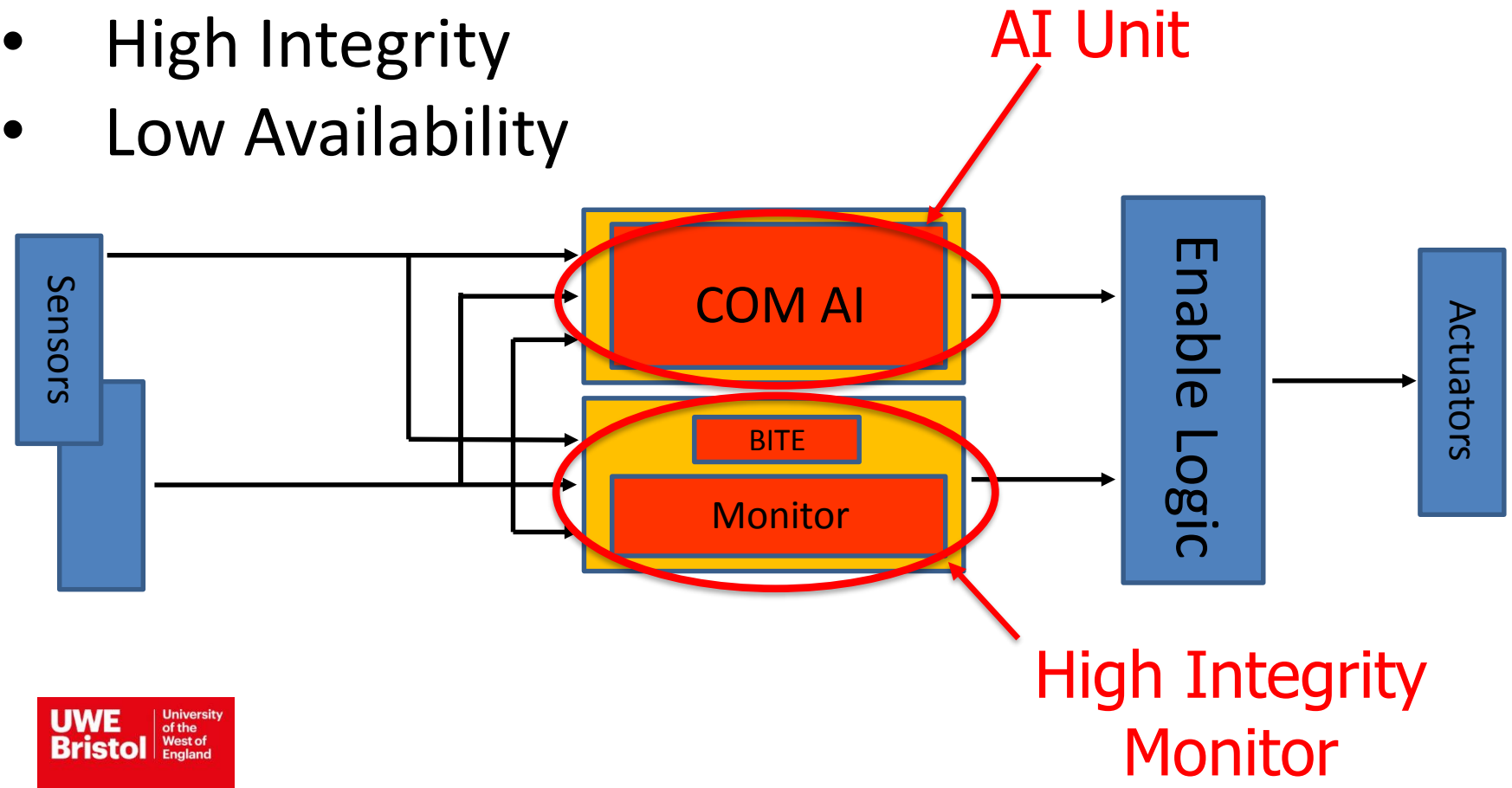
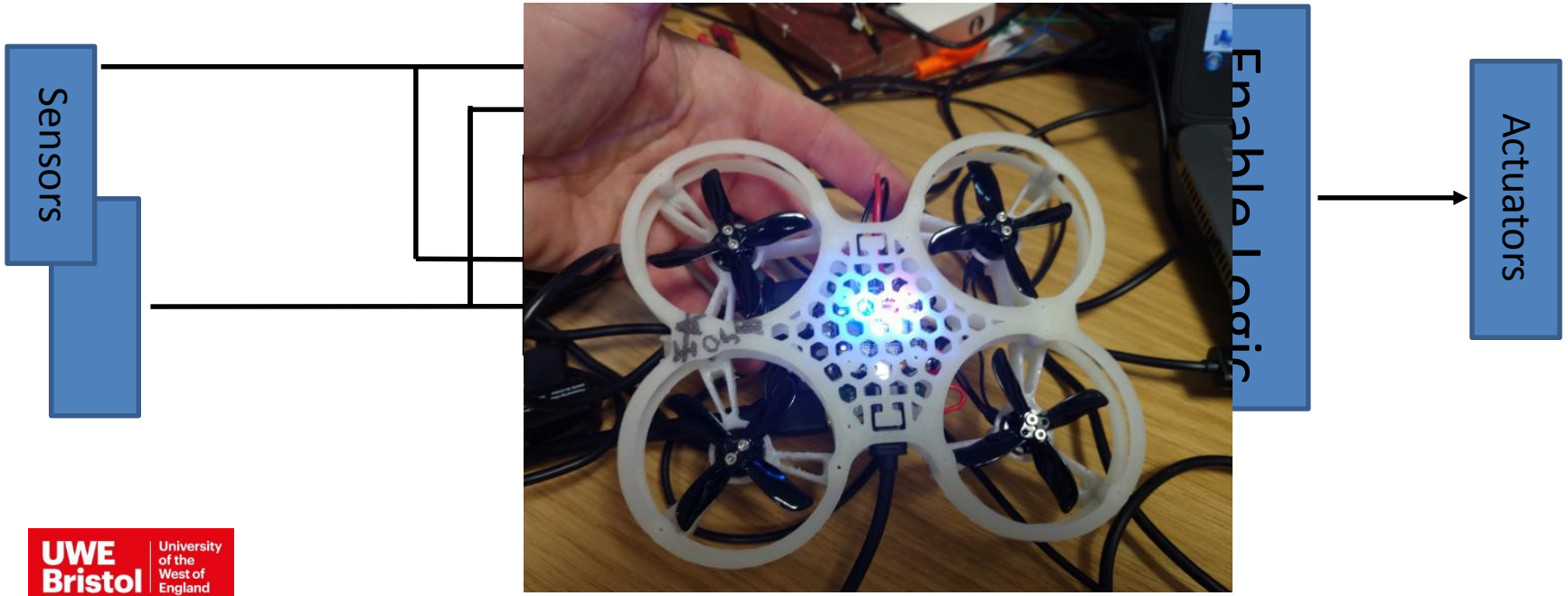
Solutions - Failsafe Architectures

- High Integrity
- Low Availability



Solutions - Failsafe Architectures

- High Integrity
- Low Availability **+ Low Severity**



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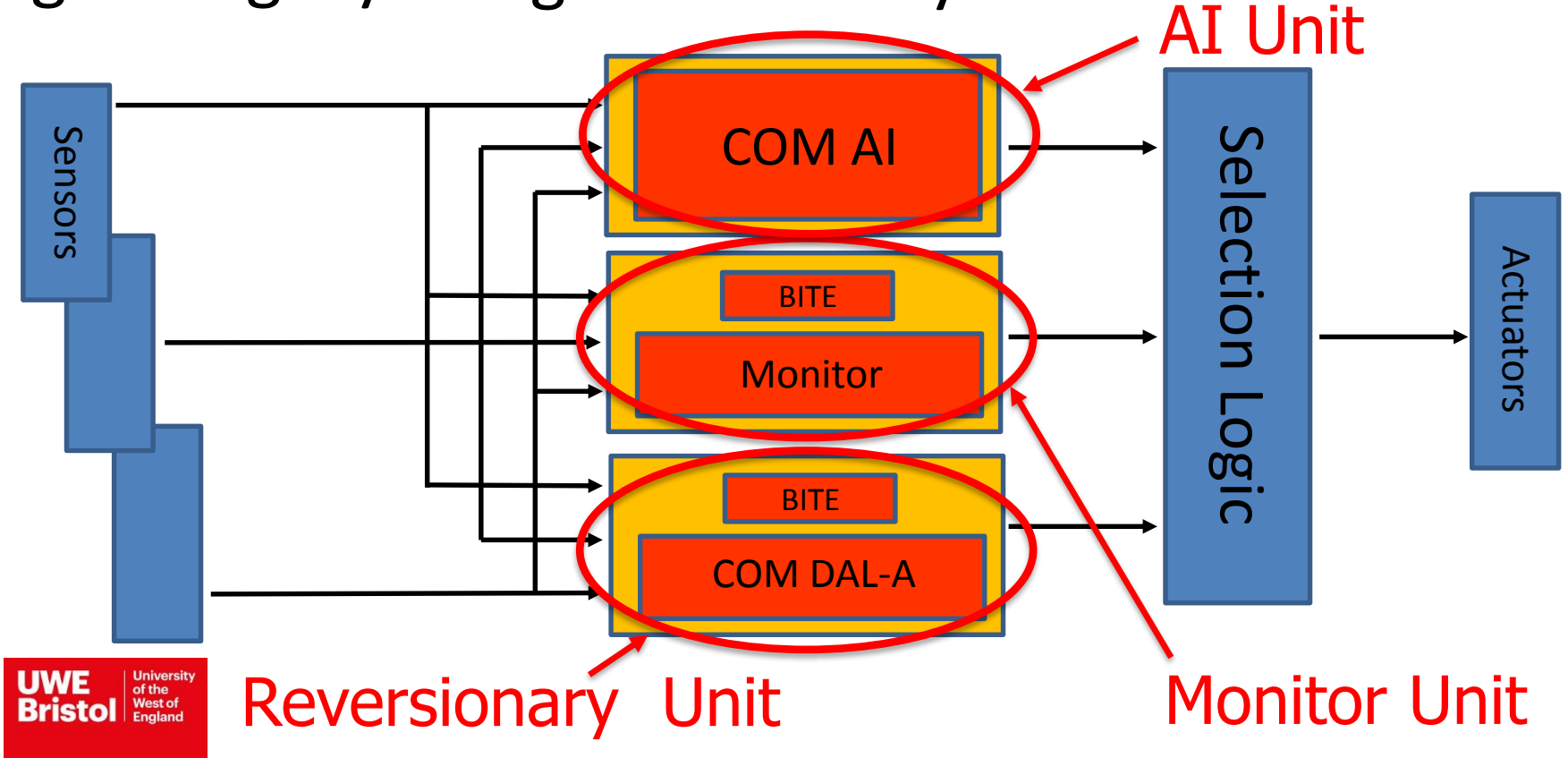
Solutions - Failsafe Architectures

High Integrity + High Availability



Summary

- AI can enable the next wave of drone use
- Deployment is easy, and solves a lot of problems
- *Integrity* is the problem

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Conclusion

Easy, Hard, or Impossible?

Hard …but achievable

Place your bets!

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