Industry Technical Advisory Committee

Session Introduction
Autonomous Systems

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What is Autonomy?

'The ability of a system to achieve operational goals in complex domains by making decisions and executing actions on behalf of or in cooperation with humans'

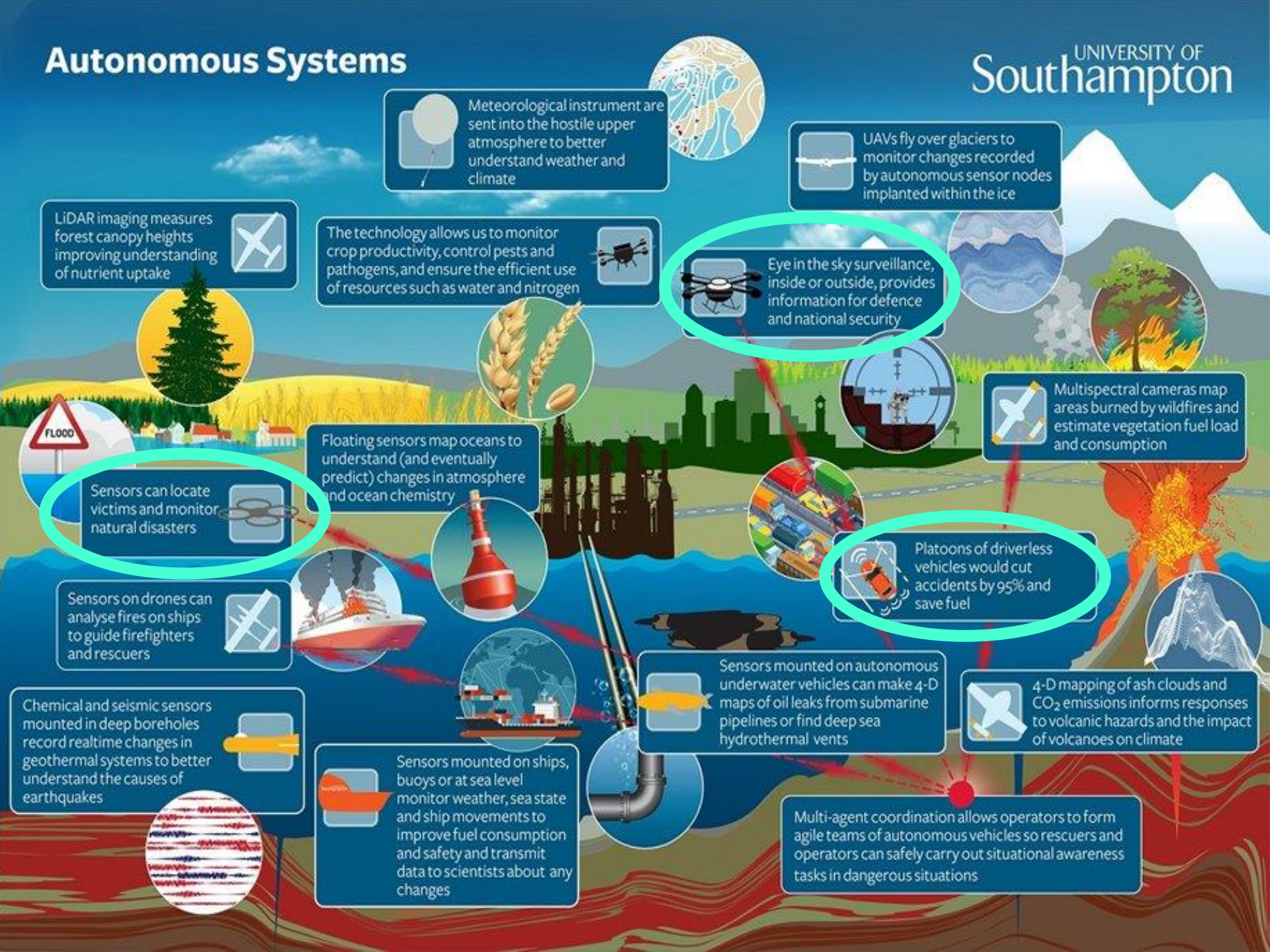
- What this means…computers are trusted with tasks previously carried out by humans, and also tasks beyond human capacity such as keeping a ship in fixed position or allowing unstable airplanes to fly safely

Applying Autonomous Systems

- The Oil & Gas industry stretching the limits of what can be achieved with current technology
- Autonomous systems represent an emerging new system category that can provide solutions to meet these challenges
- Other industries are already utilising autonomy in order to execute tasks that cannot be performed by humans alone
- Efforts mainly been driven by aerospace/military i.e. deep space robots, unmanned aircraft and vehicles, smart monitoring systems
- There are challenges in oil spill response that could be solved with similar solutions

Autonomous Systems

UNIVERSITY OF Southampton



Potential Benefits of Autonomous Systems

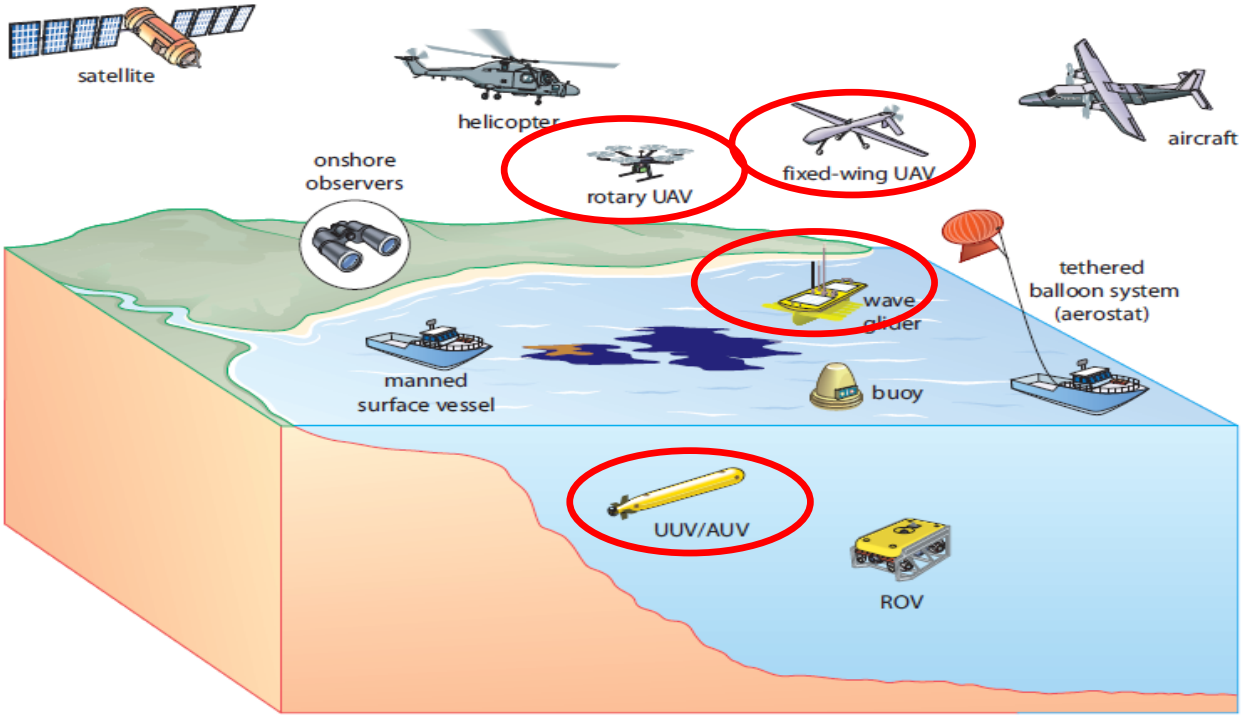
- **Reduced risk:**
  - Reduced human exposure to danger i.e. reduce or eliminate people working on-site
- **Reduced cost:**
  - Less need of costly human supervision
  - Increased up-time
  - Reduce dependence on resources required to support humans i.e. expensive vessel time (require limited resources to deploy and recover)
- **Optimal operations:**
  - Increased situational awareness = improved decision making i.e. near real time and long term datasets, large spatial resolution datasets
- **Simultaneous operations:**
  - Co-operating robot teams i.e. joint asset integrity and environmental compliance surveys, pipeline day to day monitoring and spill response
- **Time/schedule improvements:**
  - Operate one or more systems independently or in parallel
- **New areas:**
  - Enables surveys of previously inaccessible areas

Challenges of Autonomous Systems

- Overreliance on new technology – recognising limitations
- Regulatory acceptance and support i.e. safety standards
- Human trust of the systems - crucial that people trust the systems
- Public perception
- Data security
- Dual use
- Risk of vehicle loss – high value assets
- De-confliction i.e. marine vessels, manned aircraft
- Service companies still maturing

Application of Autonomous Systems in oil spill response

- Preparedness
- Response



- Unmanned Aerial Systems (UAS)
- Marine Autonomous Systems (MAS)

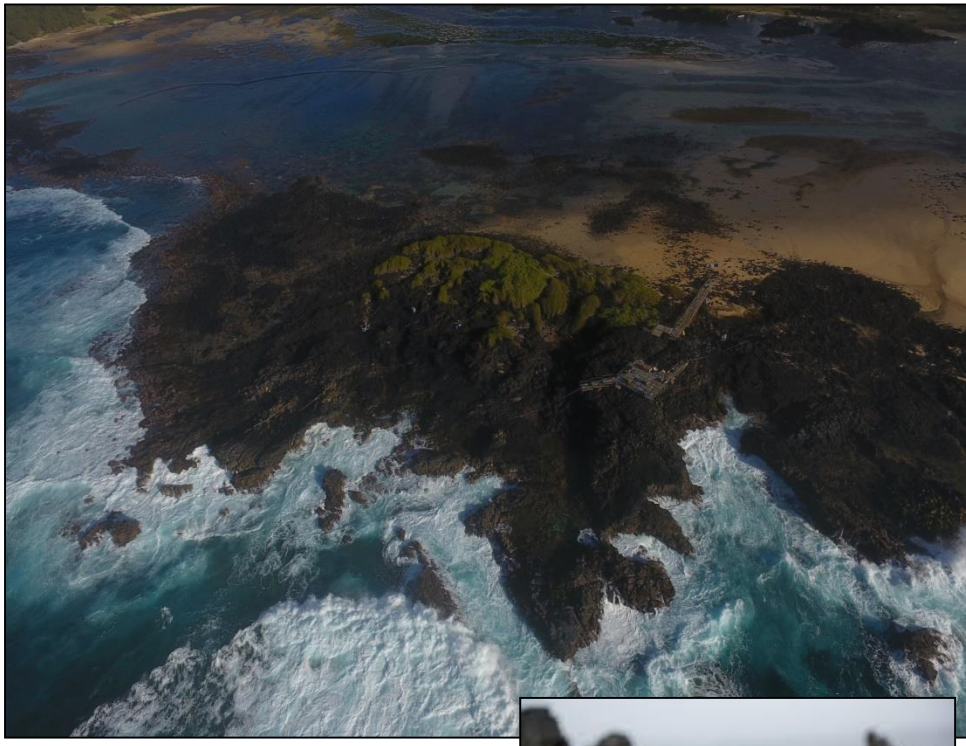
The OSR-JIP represents the oil industry's consensus view on good practices related to oil spill preparedness and response http://www.oilspillresponseproject.org/

itac: Industry Technical Advisory Committee for oil spill response

Unmanned Aerial Systems in oil spill response

Response – salvor/shoreline clean-up support (efficiency and safety)

- Surveying oil in the lagoon/shoreline/boom
- Surveying during the re-floating operations
- Photos/video
- Challenges



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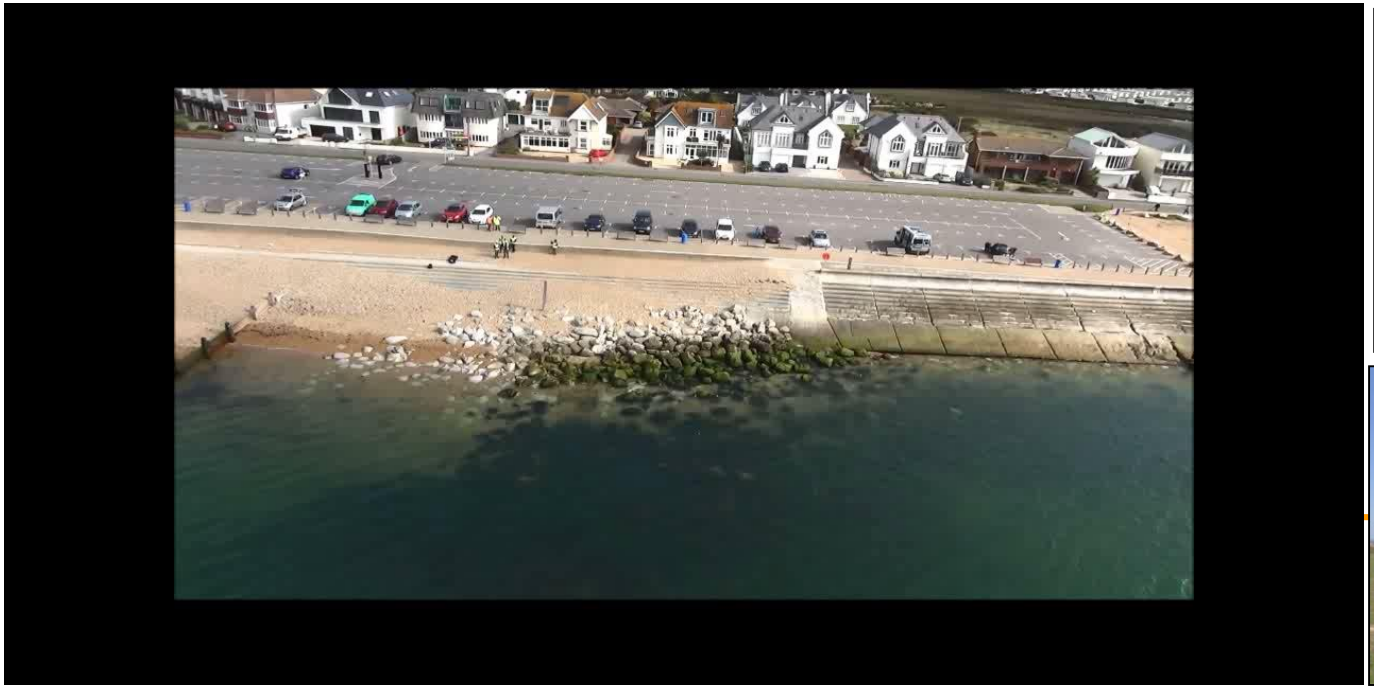
Unmanned Aerial Systems in oil spill response

Response – SCAT support (safety/efficiency)

- Segmentation
- Scaling the incident
- Oiled Shoreline Assessment form



Unmanned Aerial Systems in oil spill response

Response - improve encounter rates (efficiency)

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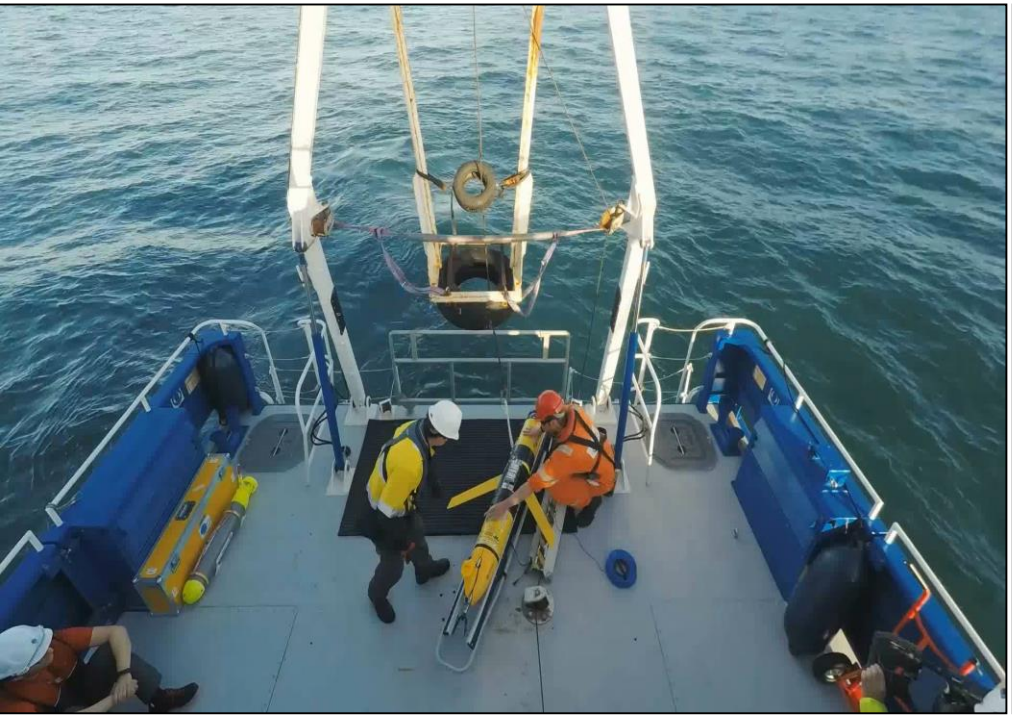
WCMRC & ECRC

- WCMRC (purchased UAS):
  - Shoreline site assessments
  - Shoreline response plan development
  - Equipment training
  - Offshore to improve encounter rates
- ECRC (hired UAS): placing river protection booms

Marine Autonomous Systems in oil spill response

Response – next generation fluorometry, plume mapping, baseline surveys



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Autonomous Systems: Session Focus

- Primary focus of this session is Marine Autonomous Systems;
  - Current and future developments in Marine Autonomous Systems
  - OSRL Oil on Water exercise 2017
  - Marine Autonomous Systems for oil spill response: The NOC-OSRL autonomy project and reflections on the 2017 Oil on Water Exercise

Oil Spill Response

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Possible uses of UAVs

Response - shoreline

- Baseline surveys
- Segmentation
- Scaling the incident (basic oiling levels)
- Completion of the ‘Oiled Shoreline Assessment’ form
- Completion of ‘Shoreline Treatment Recommendation’ (STRs)
- Post treatment inspection and evaluation
- Long term monitoring
- Wildlife surveying
- Booming plans
- Gas monitoring
- Site security (equipment and people)

Preparedness - shoreline

- Habitat surveys
- Booming plans
- Wildlife surveys

Response – offshore

- Improving encounter rates
- Gas monitoring