Australian Government
Department of Defence
Defence Science and
Technology Organisation

Opportunities for Trusted Autonomy in Humanitarian Assistance/Disaster Relief (HADR)

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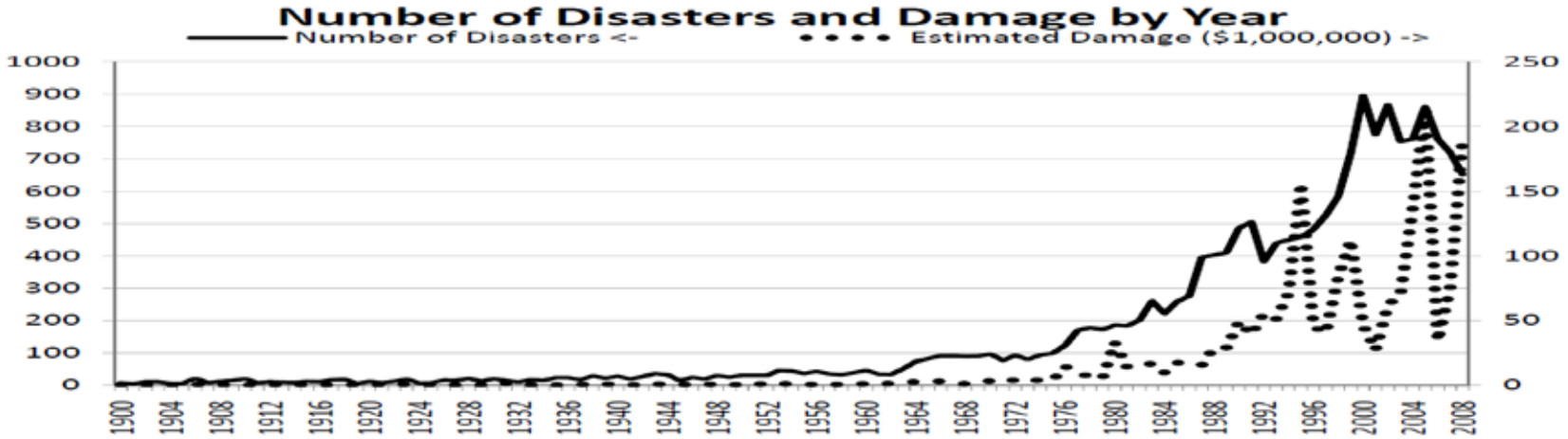
Defence and Humanitarian Assistance

- Government's expectation is that Defence will be there to support HADR events.

HADR Background

- The HADR environment is complex, dynamic and initially unknown
  - Communities and landscapes are transformed.
- Governments declare disasters quickly and must respond without delay to provide relief and clean up debris.
  - But for major events, it is often not possible to provide all the support required



HADR Scenarios

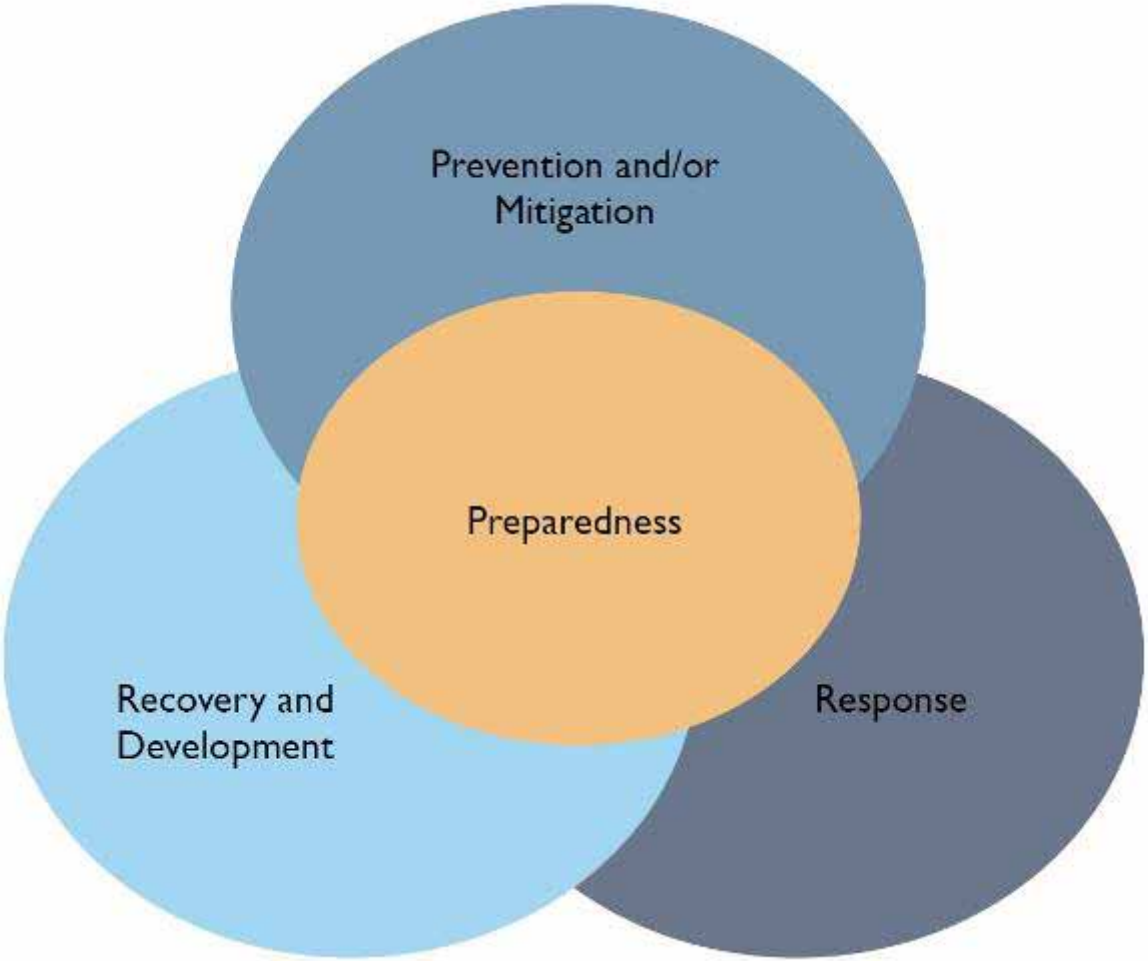
Whole of Nation

Scale
Complexity

Jurisdictional
Diplomacy

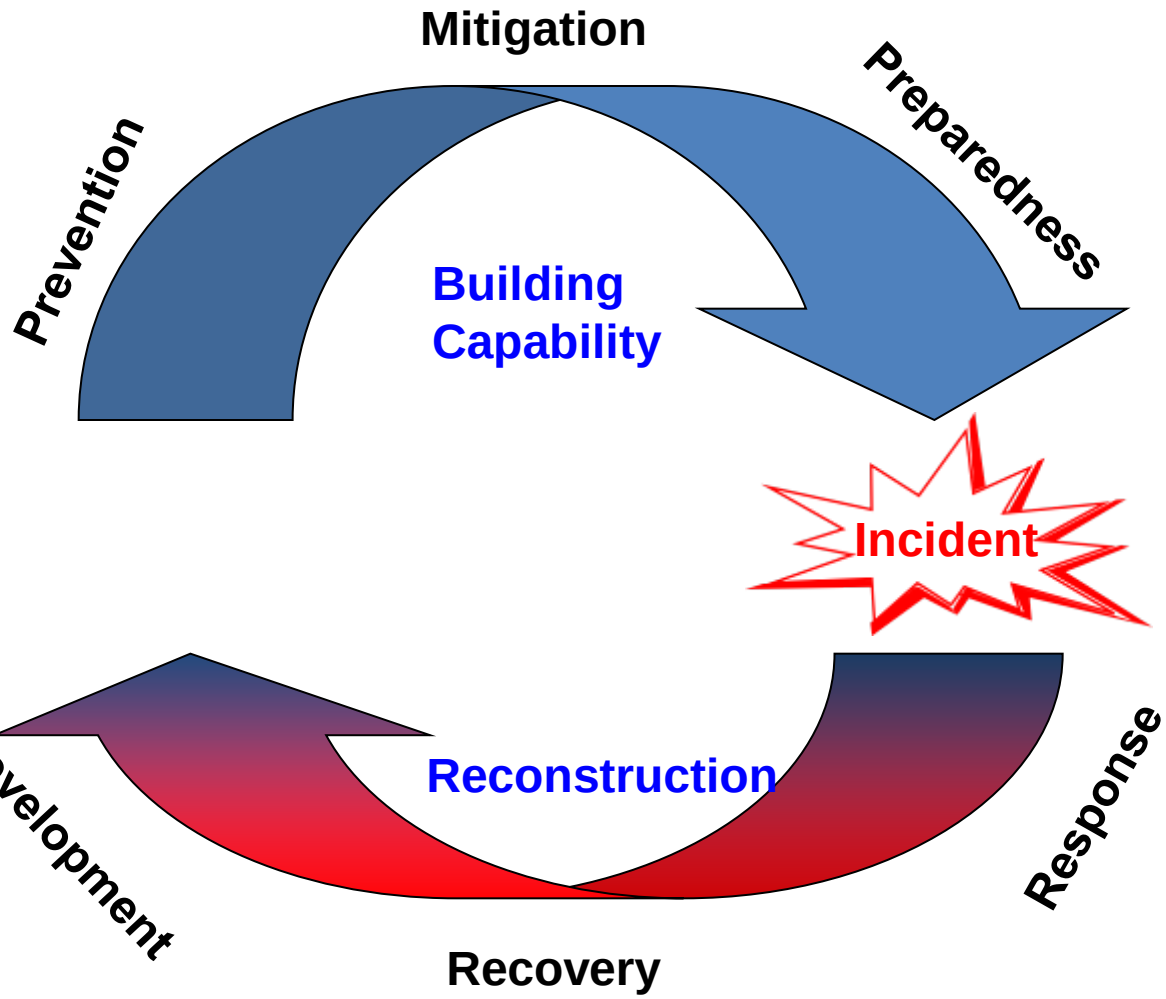
Measures

Spectrum of Disaster Management



Asia Pacific Civil-Military Centre of Excellence, 2010

Disaster Management Continuum



Reconstruction Examples

- Specialist roles
  - Fukushima Reactor / Ebola examples
- Surveillance
  - SWIR Monitoring
- Autonomous supply
  - How to ensure distribution according to need & without infrastructure.
- Dynamic communication networks

Building Capability Examples

- Preparedness:
  - Predictive / Surveillance
  - Automation in 5th Generation Command and Control systems
  - Pre-event capabilities to allow positioning of capabilities and supplies.
  - Automated scenario testing and exercising.

HADR and Autonomy

- Current autonomous systems are challenged tackling uncertainties with weather, unstructured environments, and lack of infrastructure.
- The complex HADR environment presents a complex challenge for autonomous systems to overcome – learning and adaption will be critical.
- Need to understand areas of highest impact application for autonomous systems, and trial deployments

Where to Apply Autonomous Systems?

All decision makers need information

- Whole Of Government Effort: Civil and Military
- NGOs; International Agencies; Private Sector

Information Resource Collaboration

- Improved situational awareness
- Better unity of effect

Challenges to Sharing

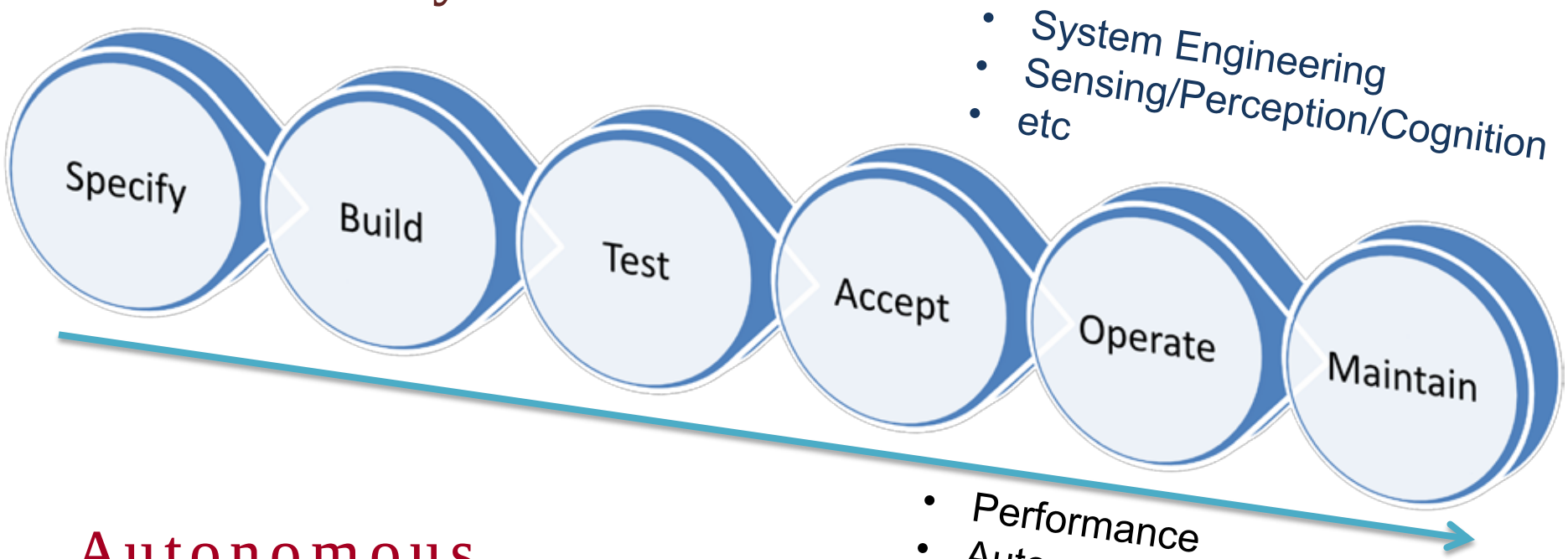
- Understandable And Actionable Information
- Accessible Multi-Hazard Decision Tools
- Mechanisms for effectively sharing resources and solutions
- "Feeding the beast"

HADR: Opportunities for TAS

- Autonomous systems and computational agents will impact the preparedness, planning and decision making for HADR.
  - Autonomy has to be considered within the larger context of the disaster management enterprise
  - Balanced portfolio of research and development programs
  - Autonomous capabilities should be designed to compliment human decision makers
- Could undertake tasks like:
  - Mining and analysis maps, buildings and land; assess severity and extent of an event; coordinate search and rescue; optimize resources and logistics; process and transmit data to be actionable; project consequences and opportunities of a disaster;

Why "Trusted" Autonomous Systems

Traditional Systems



Autonomous Systems

DSTO's Trusted Autonomy Research Thrusts

Foundations of Autonomy

How to achieve the "plasticity imperative" – coping with unpredictable events; military operations in contested, unstructured and uncertain environments;
Significantly reduce exposure to harmful consequences;
Guaranteed behavioural adherence to encoded boundary conditions; New means to certify systems for ADF use.

Machine Cognition

Fast reactive and simultaneous slow logical "thinking"
Machine high-level fusion and planning to improve perception and control;
Large scale control of machines; Machine-machine interaction and tasking.

Trustworthy Partners

Human-machine & machine-machine interacting teams more effective than human-only teams;
Understand organisation changes required to acquire and operate;
Trust of machines; Mission Command of machines.

Novel Platforms, Sensors & Effectors

Exploit existing and develop new: sensors, platforms, materials & propulsion;
Sound research based on field experience and validated models;
Innovations with high technical risk, but low strategic program risk.

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Questions

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