



# US Navy and Interests in Autonomy R&D

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Distribution Statement A: Approved for public release

# Drivers of Autonomy R&D

- **Manpower efficiencies**
  - Reduce human footprint
  - Reduce personnel cost
- **Rapid response, 24/7 aware**
  - Timely, persistent, enduring
- **Harsh environments**
  - Day/night, hot/cold
  - Weather/rubble
- **New mission requirements**
  - Increasing competence
  - New capabilities
- **Advanced medical apps**
  - Critical response
  - End-to-end critical care
- **Logistical support**
  - Reduce logistics burden



# Autonomy: Technical Challenges and Objectives (1/2)

- **Machine Perception, Reasoning and Intelligence (MPRI):**

- Common Representations and Architectures
- Learning and Reasoning
- Understanding the Situation/Environment
- Robust Capabilities

- **Human/Autonomous System Interaction and Collaboration (HASIC):**

- Calibrated Trust
- Common Understanding of Shared Perceptions
- Human-Agent Interaction

### Behaviors



Learning



### Architectures



Semantic Perception

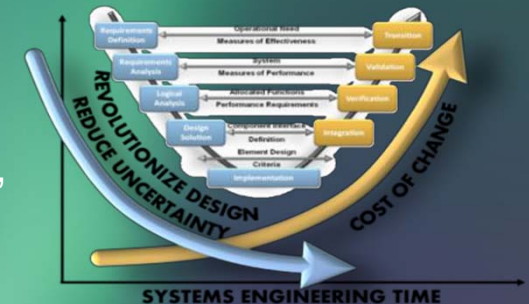


Teaming with Humans & other agents



## Autonomy: Technical Challenges and Objectives (2/2)

- **Scalable Teaming of Autonomous Systems (STAS):**
  - Decentralized mission-level task allocation/assignment
  - Robust self-organization, adaptation, and collaboration
  - Space management operations
  - Sensing/synthetic perception
- **Test, Evaluation, Validation, and Verification (TEVV):**
  - Methods & Tools Assisting in Requirements Development and Analysis
  - Evidence based Design and Implementation
  - Cumulative Evidence through Research, Development, Test, & Evaluation (RDT&E), Developmental Testing (DT), and Operational Testing (OT)
  - Run time behavior prediction and recovery
  - Assurance Arguments for Autonomous Systems



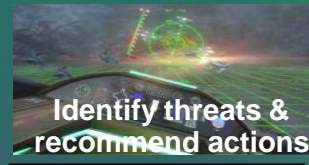


# Naval Programs Focused on Technology for Increasingly Intelligent Systems

## Operating Safely & Efficiently



## Machine-Assisted Operations



## Human-Machine Teams



Near-Term  
Present - 2020

Mid-Term  
2020-2030

Far-Term  
2030+

*Teaming of Humans and "Intelligent Machines" to Expand Capabilities*

# The Role of Partnerships for Naval Technology



- Why does the US Navy and US Marine Corps undertake partnerships?
  - Building and Deepening Relationships
  - New Technology Development
  - Existing Technology Maturation, Integration, and Customization
  - Shared Expertise and Risk Reduction
  - Shared Costs and Shared Capability
- We look forward to continued cooperation with Finland
  - Business Finland (TEKES)
  - MoD

***For the US Navy and USMC Team, the best kind of ships are PARTNERSHIPS!***



Kittos!

Questions?

For further interest, Business Finland (TEKES) can help