Autonomy and the National Defense Strategy

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Benefits of Autonomy ...

- Increase the speed and accuracy of decisions
- Enable new tactics and operational concepts requiring persistence and endurance
- Reduce the risk of casualties to both civilians and US troops
- Enable operations in Cyber/EW environments
- Enable use of unmanned platforms when comms to those platforms are denied
- Enable ability to operate platform if human operators are injured or killed
... and Challenges of Autonomy

- **Programmatic**
  - Technology or Application
  - Ubiquity

- **Operational**
  - CONEMP/CONOPs
  - An unwillingness to reduce force structure
  - Trust and confidence issues related to autonomous behaviors

- **Moral**
  - Responsibilities associated with the unmanned application of force

- **Policy**
  - Who is responsible and liable for an autonomous asset?
  - DOTMLPF-P – how do we make autonomous systems part of the team?

- **Technical**
  - Machine Perception, Reasoning and Intelligence
  - Human/Unmanned System Interaction & Collaboration
  - Scalable Teaming of Autonomous Unmanned Systems
  - Test & Evaluation and Verification & Validation
Role of the Assistant Directors

- **USD(R&E) Mission**
  - Ensure Technological Superiority for the U.S. Military
  - Bolster Modernization

- **Assistant Directors**
  - Develop DoD-wide vision and strategy for modernization priorities
  - Develop technology roadmaps
  - Collaborate with DoD/federal partners, industry, academia, and international partners
  - Support Senior Leadership with technical expertise
Autonomy Col Overview

**Autonomy is the freedom to select a course of action required to achieve a higher authority's objective(s)**

- **Col Goal**
  Advance autonomous systems by assessing S&T investments, gaps, and opportunities, and initiating critical enabling technology development.

- **Autonomy Col Sub Areas**
  - Machine Perception, Reasoning and Intelligence
  - Human/Autonomous System Interaction and Collaboration
  - Test, Evaluation, Validation, and Verification
  - Scalable Teaming of Autonomous Systems
**LOE 1: Build a more lethal force**

- Improve mission performance while lowering cost by providing support in extended duration missions where sufficient manning is impractical.

- Mitigate risk when the operating environment is too dangerous for manned platforms or in communication-denied environments when remote piloting is impossible.

- Overcome adversarial combat threats that are too numerous, fast, and/or dynamic for human engagement or countermeasure management.

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**Teaming of Humans and “Intelligent Machines” to Expand Capabilities**

**Mitigate Risk**
- Capabilities for C-IED
- Capabilities for CBRNE
- Air collision avoidance

**Extend the Reach/Prevent Surprise**
- Single-user multi-robotic control
- UAV/UGV collaboration & control
- Extended duration ISR operations

**Dynamic Engagement**
- Enable Command and Control
- Provide robust and resilient communications in the tactical field
LOE 2: Strengthen the operational pull for autonomy

- Conduct experimentation to develop new CONOPS for autonomous systems
- Conduct extensive testing in realistic environments, including humans, to ensure that systems operate effectively and are relatively resistant to adversarial behavior
- Leverage commercial R&D in autonomy to reduce costs, particularly in logistics, maintenance, and information analysis
LOE 3: Accelerate DoD adoption of autonomous capabilities

- Develop a common development framework and architecture for autonomous systems and pursue community compliance

- Pursue development/refinement of and compliance with accepted interoperability standards for autonomous systems

- Ensure air-land-sea range infrastructure for TEV&V of and experimentation with autonomous systems

- Leverage private sector R&D in low-cost aerial systems, data analysis software, cyber defense, human-machine interaction, and efficiency-related technologies
The DoD Autonomy Roadmap

Autonomy can transform the DoD by expanding operational capabilities with improved safety, effectiveness and manpower efficiencies. It could become our greatest offset...or deficit.

Machine-Assisted Operations

Operating Safely & Efficiently

- Air Collision Avoidance
- Work-centered PED cell
- Threat identification & COA recommendation
- Extending Human Range
- Logistical Operations
- Cueing Analysts From Fused Sensor Data

Man-Unmanned Teams

- Heterogeneous Swarms
- Man-Unmanned Teaming

2025 - 2028+

2021 - 2024

Present - 2021

Near-Term  Mid-Term  Far-Term

Teaming of Humans and “Intelligent Machines” to Expand Capabilities
Potential Engagement Opportunities: Authorities, Funding Sources, and Partnerships

Exploring Ways To Change The Way We Do Business

- USAF
- USA
- USN
- USMC
- USD(R&E)
  - Advanced Capabilities
  - Strategic Capabilities Office
  - DARPA
  - DIU/MD5
  - MDA
- OSD
  - DTRA
  - USSOCOM

Traditional FAR Contracts
SBIR/STTR
IRAD
Other Transaction Authorities
CRADA
International Collaborations
Strengthening Alliances and Attracting New Partners

- United Kingdom
  - US/UK Stocktake Autonomy/AI Working Group

- Australia
  - Acquisition and Technology Development Working Group (ATDWG) that includes Autonomy

- Republic of Korea
  - Joint research Project Agreement in Autonomy

- Others Collaborations in Autonomy
  - US, Australia, Korea, and Japan Multilateral Agreement
  - India
  - Singapore
Technology is Transforming the Battlespace
How Do We Maintain A Competitive Advantage?

- Easy proliferation of knowledge and technology has eroded US historic advantages
- Increased rate of investment in military R&D from near-peers
- Increasingly Competitive National Security Technical Environment

*“China’s 2017 (R&D) growth is basically twice the percentage change and twice the dollar amount of change as the growth forecast for the U.S.’s 2017 R&D spending”*

Need to find pragmatic solutions to technology protection that still foster our competitive edge
Questions?