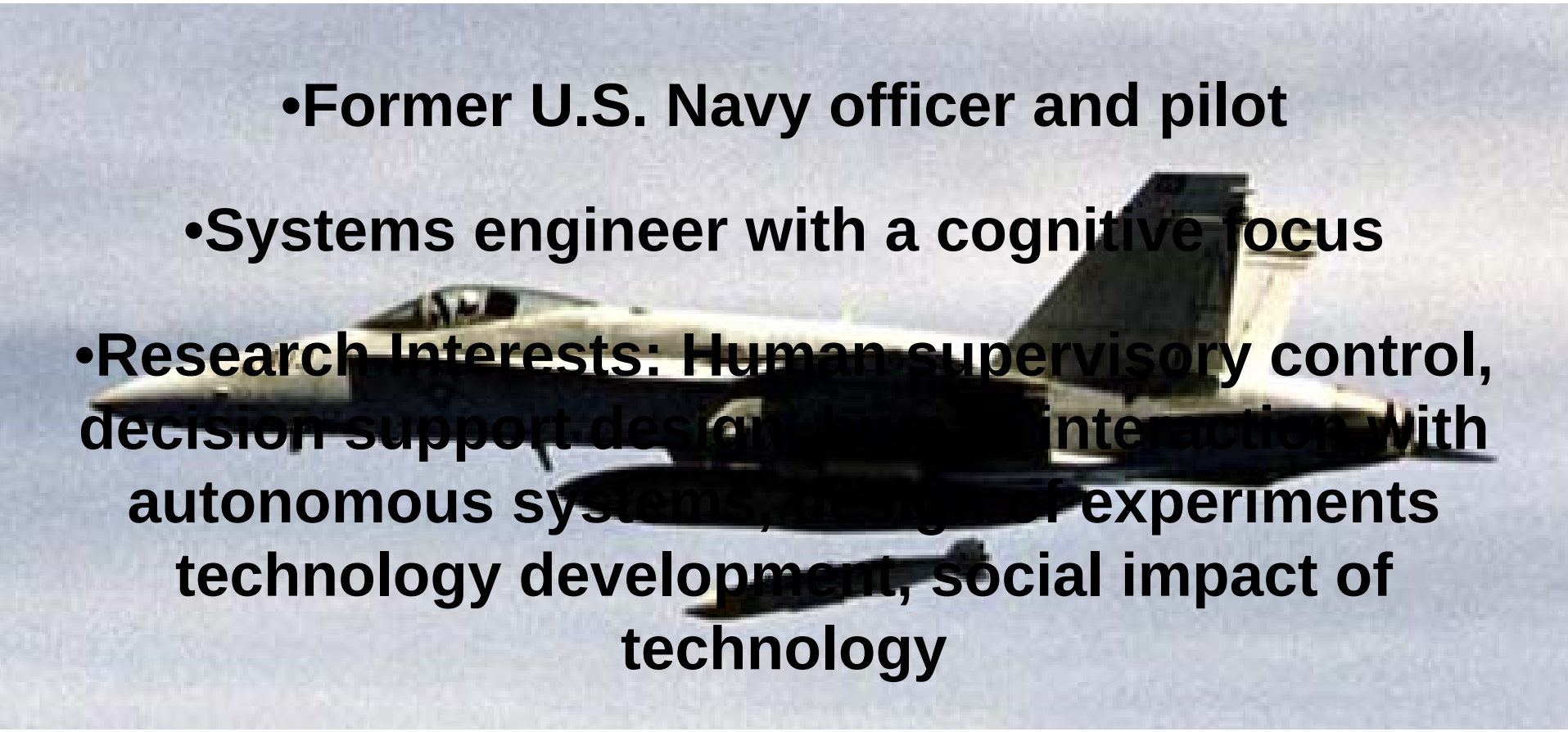
Human Supervisory Control Issues in Network Centric Operations

Mary (Missy) Cummings
Humans and Automation Laboratory
http://halab.mit.edu
Aeronautics & Astronautics
(617) 252-1512
MissyC@mit.edu

Massachusetts Institute of Technology

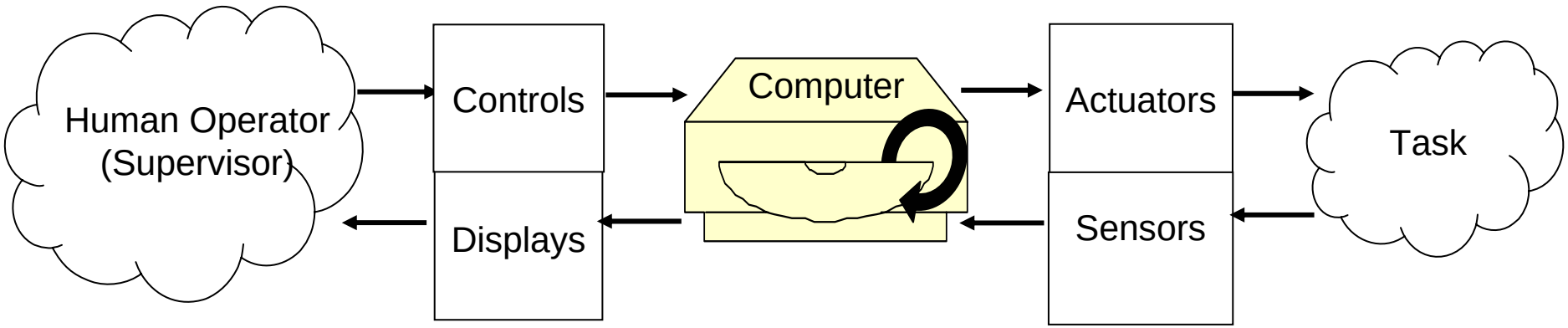
Humans & Automation Lab

HAL Director

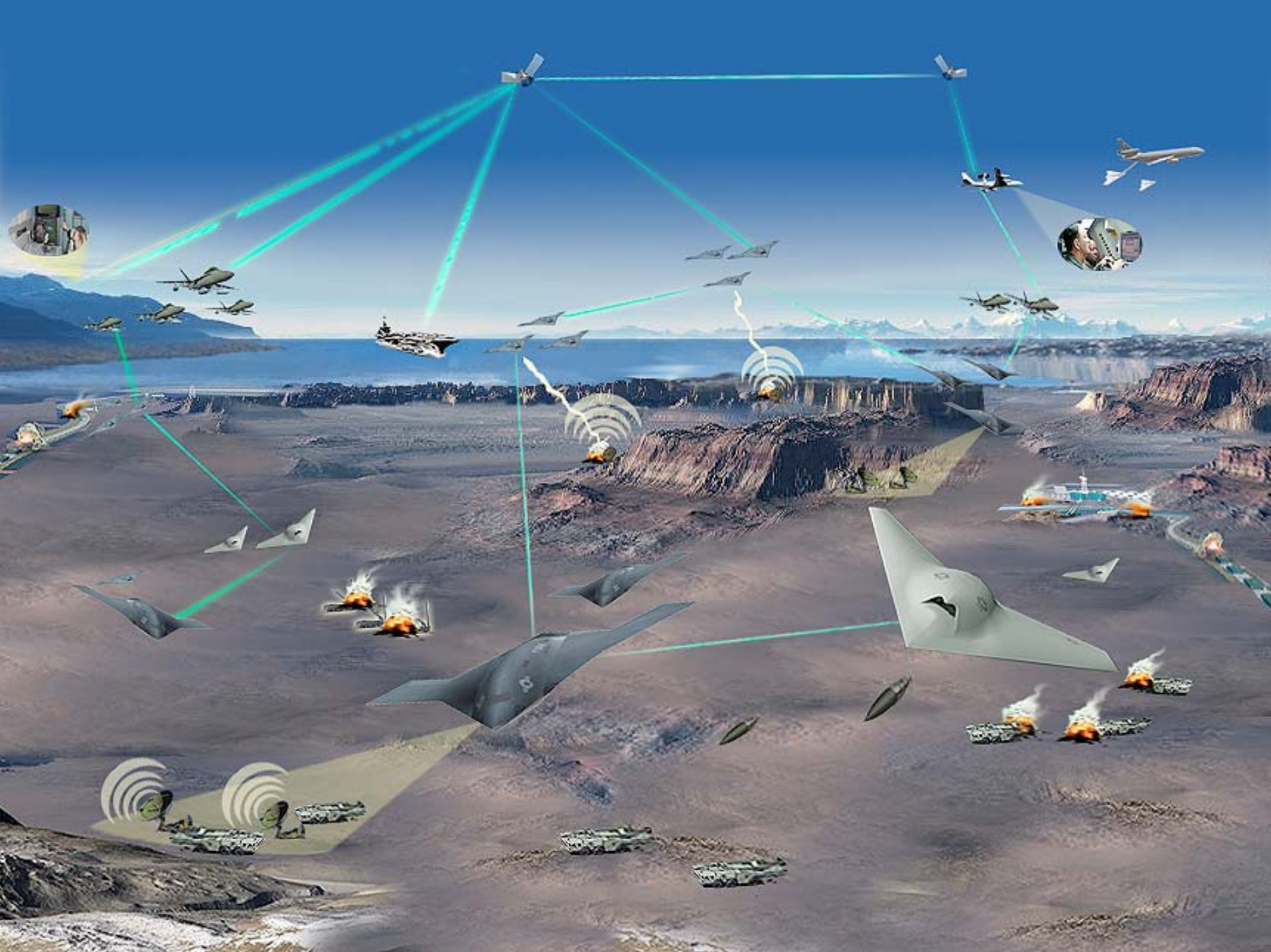


- Former U.S. Navy officer and pilot
- Systems engineer with a cognitive focus
- Research Interests: Human supervisory control, decision support design, human interaction with autonomous systems, design of experiments technology development, social impact of technology

Human Supervisory Control



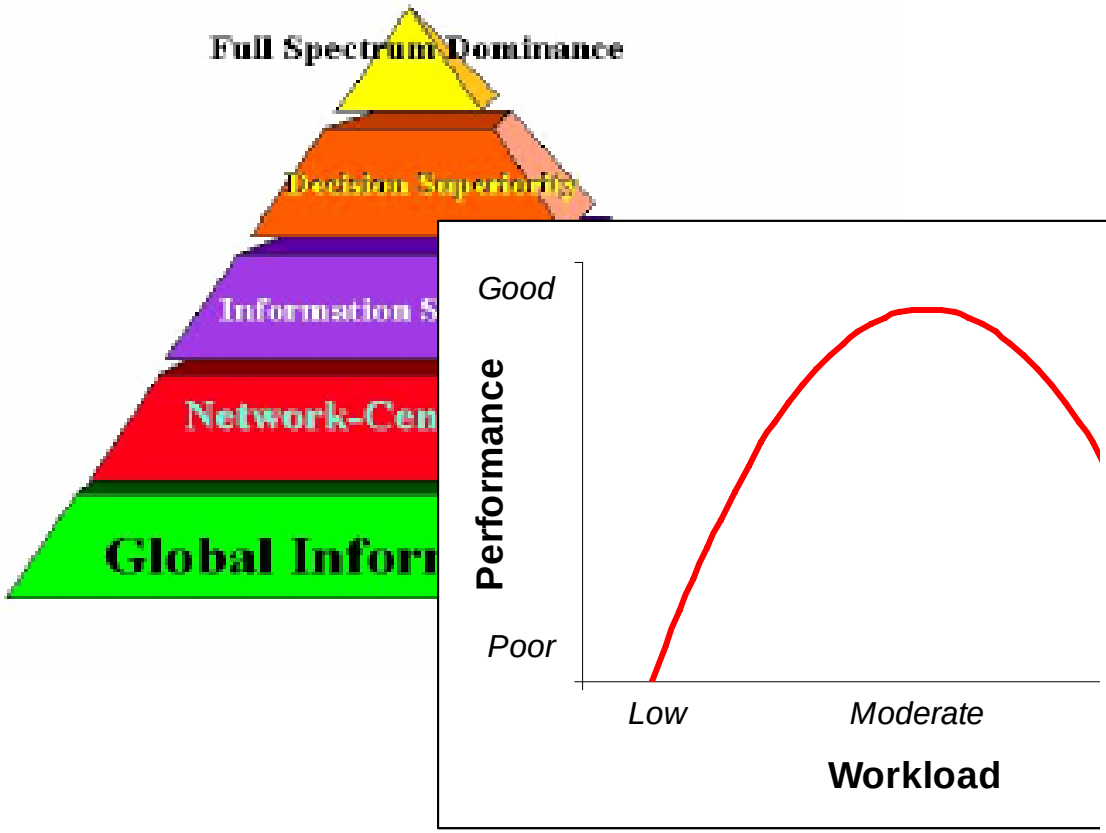
- Humans on the loop vs. in the loop
- Supporting knowledge-based versus skill-based tasks
- Network-centric operations & cognitive saturation
  - Information representation is critical

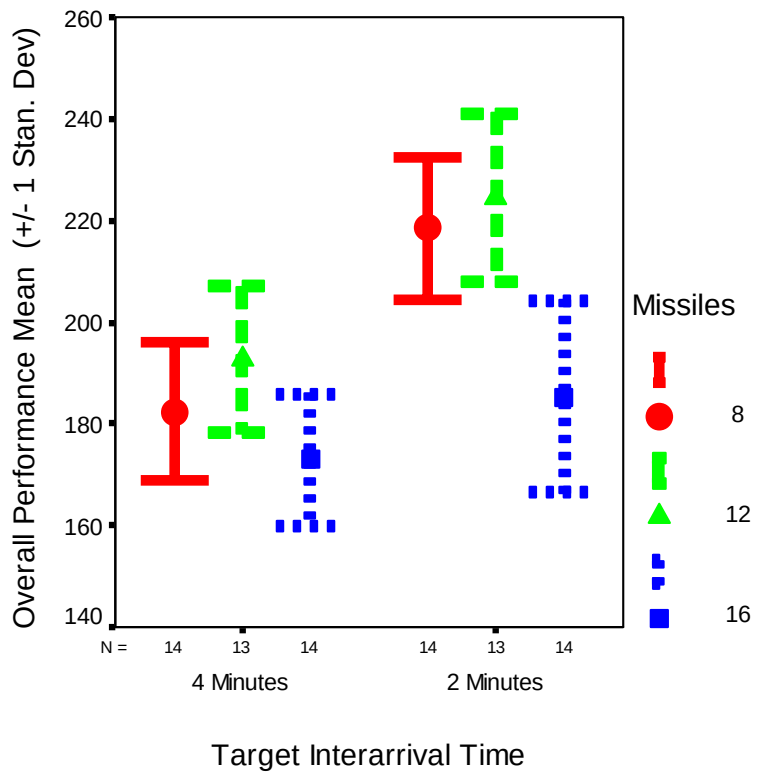


Areas of Concern

- Information overload
- Attention allocation
- Decision biases
- Distributed decision-making through team coordination
- Complexity
- Supervisory monitoring of operators
- Trust and reliability

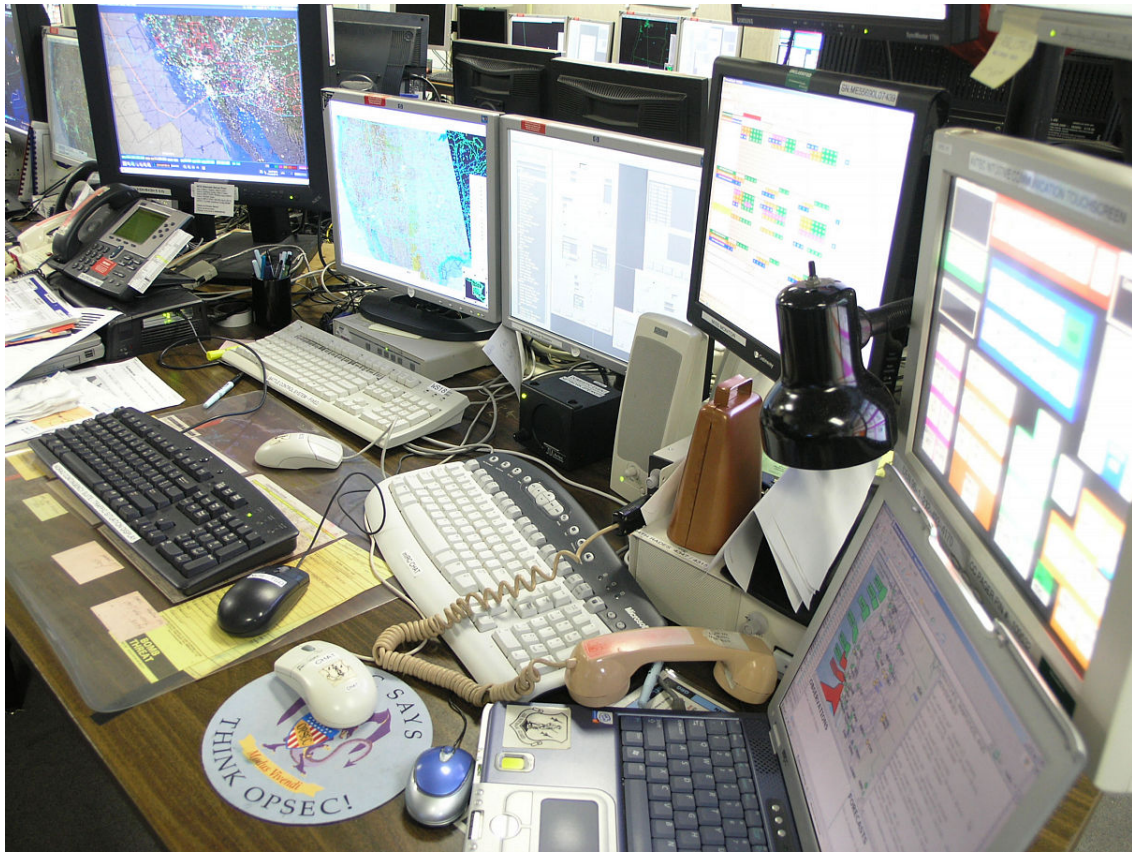
Information Overload





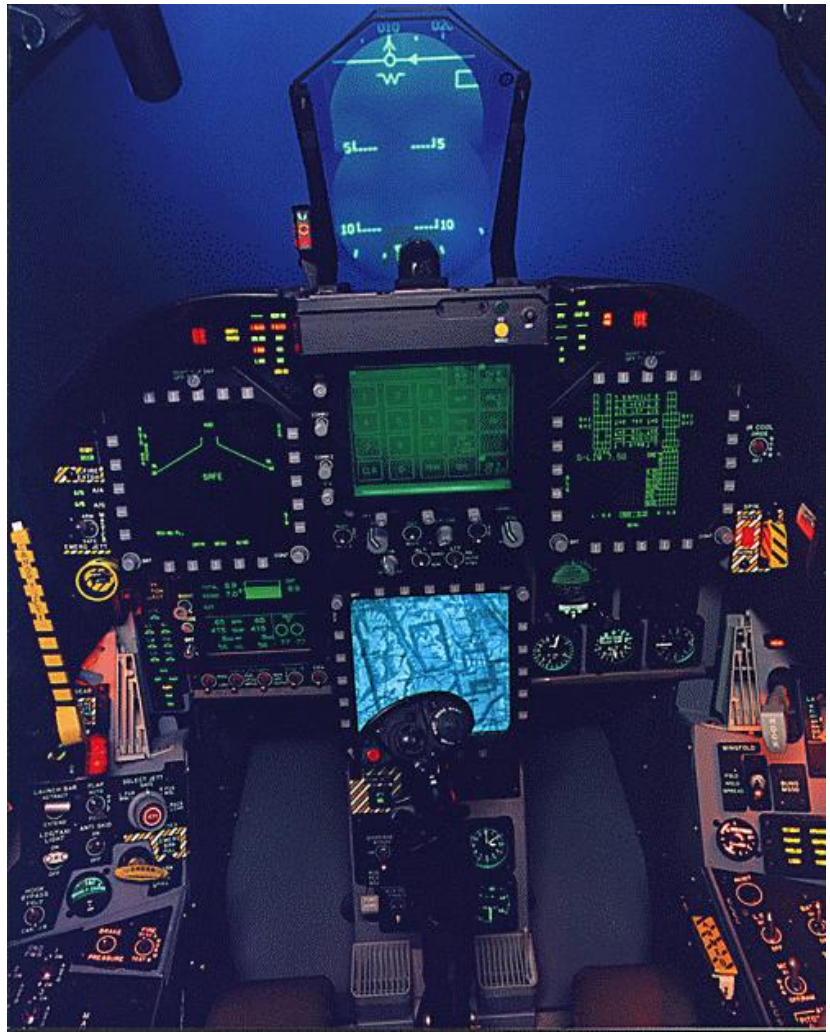
Attention Allocation

- Multiple HSC tasks = Divided attention problem
- Information uncertainties & time latencies
- Preview times & stopping rules
- Primary task disruption by secondary task
  - Chat



Decision Biases

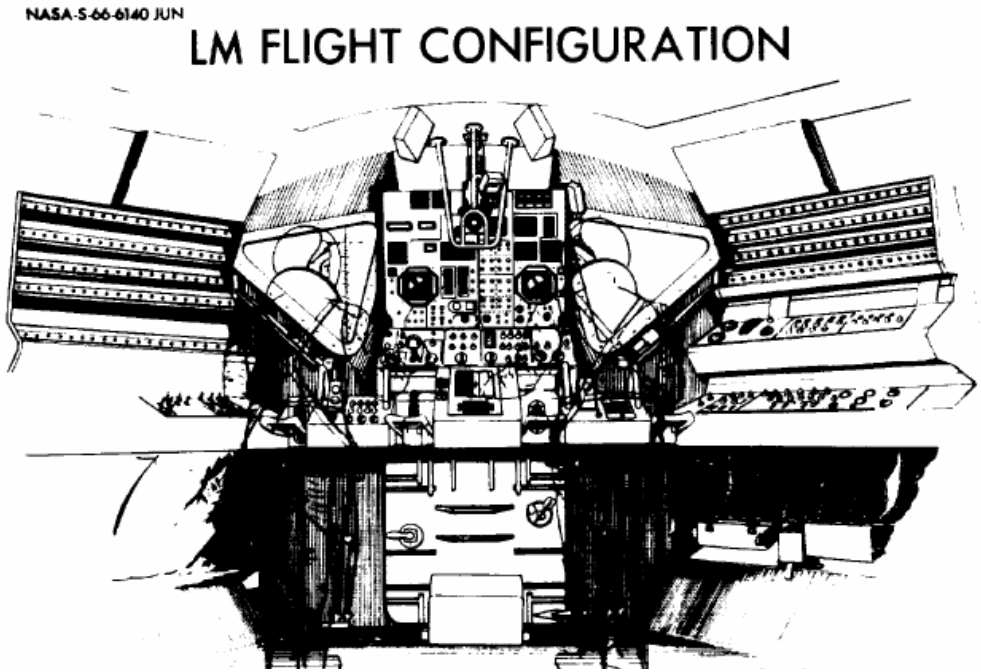
- Naturalistic Decision Making
  - Dynamic ill-structured problems with shifting goals (i.e., NCW)
  - Heuristics good & bad
- Biases
  - Confirmation
  - Recency
  - Automation



Distributed Decision-making & Team Coordination

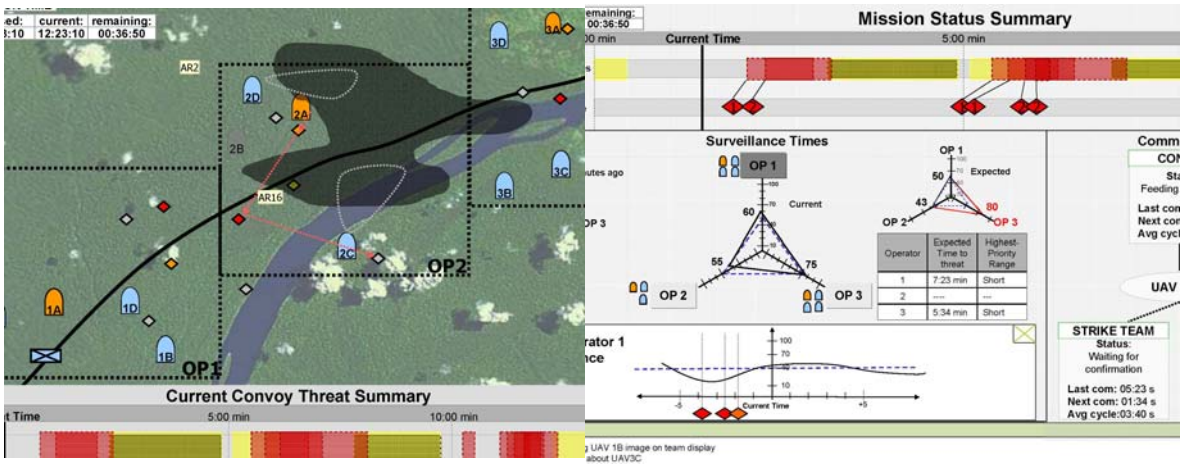
- The move from hierarchical, centralized to decentralized control
- Team mental models & shared situation awareness (SA)
- Decision support
  - Automated agents as team members
- Not just an issue for human teams
  - Swarming UAVs

Complexity

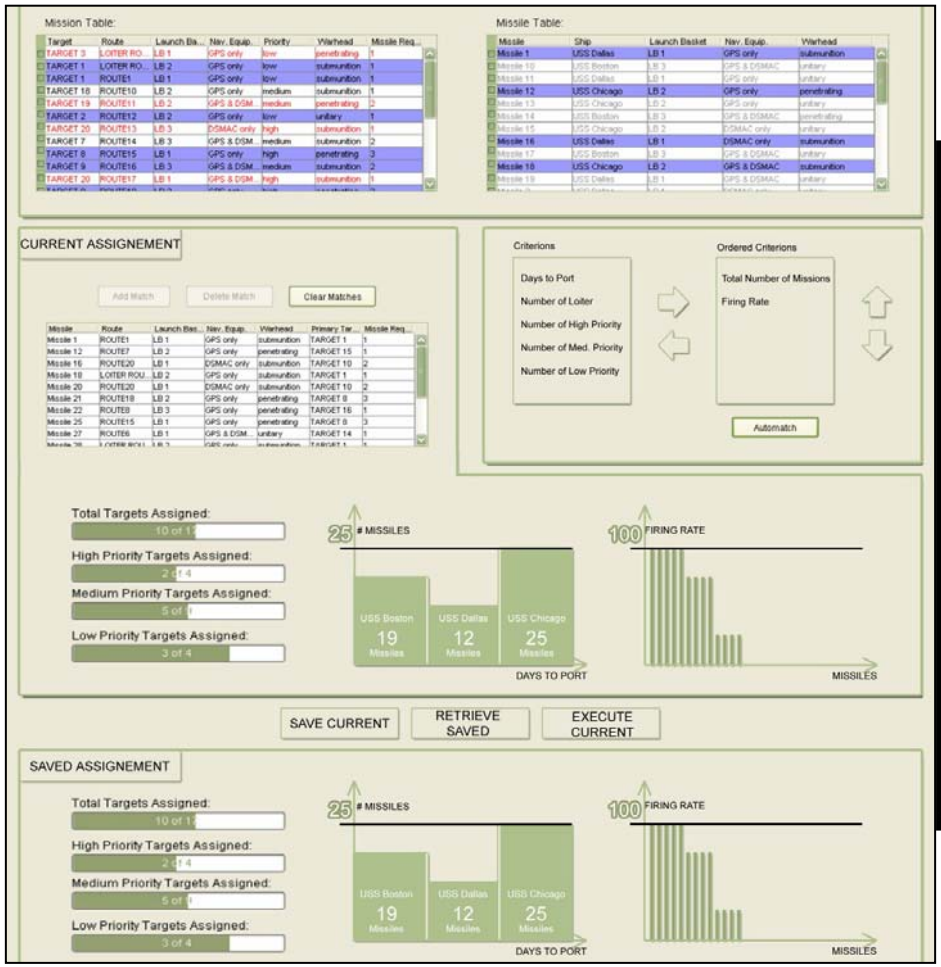


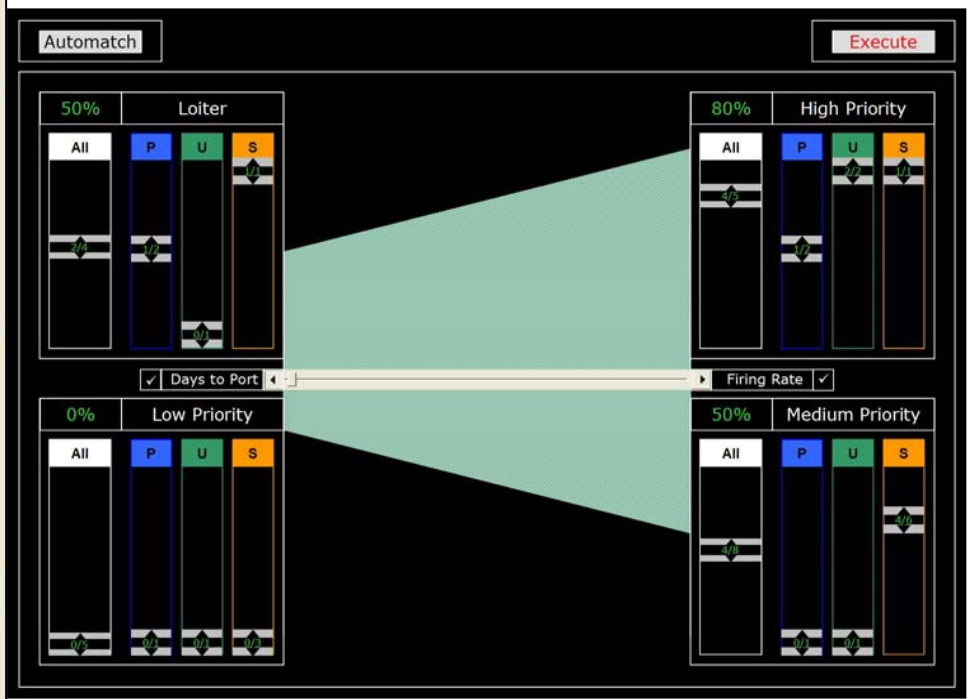
Supervisory Monitoring

- Nested supervisory control
- Two basic issues: Recognizing & intervening
- Interventions
  - Redistribute workload
  - Adding team members (both human & computer)
  - Modify mission objectives



Trust & Reliability





The Future of NCO

- Information representation is critical to mitigate cognitive workload
- Human-centered design vs. mission-centered design
  - The systems engineering process must consider humans early
  - Robust systems are needed for both human and automation brittleness considerations
    - Information access & time-pressured situations

Contact Information

- Mary (Missy) Cummings
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- MissyC@mit.edu