C2 Design for Asymmetric Advantage: Teams of Autonomous Systems & People

Naval Postgraduate School

Integrated Manned-Unmanned Missions

Background & Motivation

- Issues with C2 for Teams of Autonomous Systems & People (TASP)
  - Tall org hierarchies, long decision chains, slow mission responses
  - Manned v unmanned org, skill, culture, cost & performance differences
  - Current C2 inadequate for next generation battlespace & A2AD
- Asymmetric advantage requires C2 redesign
  - Much more than C2 *technology*
  - Requires dynamic C2 *organization & redesign*
  - Organization, acculturation, education, training & sharing important too
- How to prepare for this future 5 – 10 years ahead?

Approach & Method

- State-of-the-art computational experimentation
  - CTG mission task environment
  - 6 degrees of UAS autonomy x 4 levels of un/manned mission integration
  - Measure mission efficacy, delay, cost, risk, coordination load, others
- Model future CTG organization, C2 approach, mission assets & personnel
  - Assess performance with alternate, promising C2 designs
  - ID comparative strengths & weaknesses
  - Work backward to plan cost-effective, low-risk solutions
- Analytic results provide roadmap for Fleet implementation

Issues & Benefits

- Operationally important issues:
  - Numerous UAS will need to co-occupy same airspace-time (swarm)
  - Manned & unmanned aircraft will need to work together (TASP)
  - Aircraft from different ships, shores & nations will need to be integrated
  - Current C2 design likely to fail within 5 years
- Devising best solution is analytically intractable
  - Myriad alternate approaches, costs, benefits, risks & timeframes
  - Trial & error (OJT) with operational assets is expensive & error-prone
  - Computational experimentation is systematic, cost-effective, risk-free

CRUSER
Consortium for Robotics and Unmanned Systems Education and Research

Dr. Mark Nissen
Operational & Information Sciences
Naval Postgraduate School