Understanding the Roles of Modularity and System Architecture in Unmanned Aircraft Systems

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Motivation

- Because of Warfighter demand, the DoD's *investment is increasing tenfold* in unmanned aircraft systems (UASs) this decade. However, cross-platform *coordination is lacking*; and *cost & schedule growth* are concerns.
- Industry uses modular product architectures to manage product families to increase *market share*, increase *economic order quantities* and shorten *time to market*. Models are developed for these purposes.
- The DoD focuses on *delivering a capability for the best value*. Models for using modularity in this purpose have not been developed. These models could improve cost, schedule and performance of acquisition programs.
- This research will characterize the *benefits of a modular architecture strategy to acquire UASs.*

Research Questions

How much value can be gained by adopting a modular strategy to acquire unmanned aircraft systems?

- How much investment can be saved by acquiring a modular UAS ground segment?
- How much quicker can capability be fielded using a modular approach to UAS ground systems?
- What best practices for UAS ground system modularity exist?

Research Approach

1. Develop functional and physical models of representative UASs.
2. Identify and characterize the signals and levels of automation that exist in UASs.
3. Analyze emerging clusters of form and function in system architectures.
4. Compare clusters between different UASs and missions.
5. Identify similarities (opportunities for module development and reuse) between systems and missions.

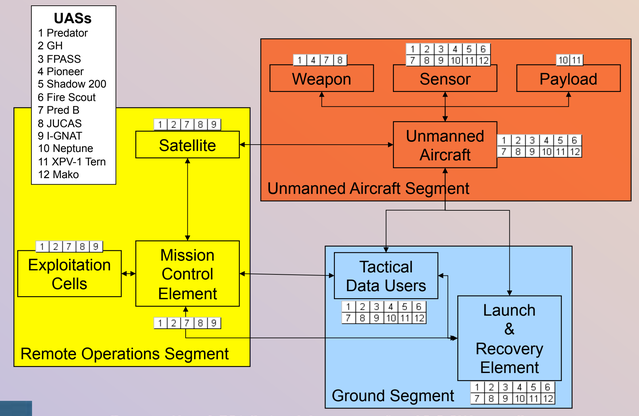
Global Hawk (www.af.mil/photos)

Predator Ground Station (www.spyflight.co.uk)

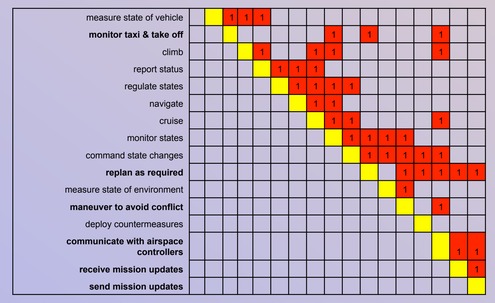
Global Hawk Ground Station www.directionsmag.com

Predator A (www.af.mil/photos)

Data Analysis



Generalized UAS Architecture for 12 Military Systems



Global Hawk: Task analysis for transit to mission location

Expected Contributions

Expand theory – apply platform optimization methods to government organizations and products

- Government products deliver a capability vice seeking profit

Methods – usually developed for profit ventures – to be developed, modified and applied to government applications