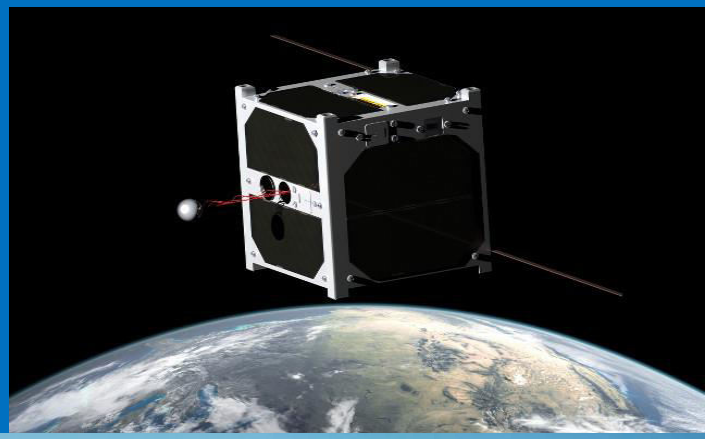
Unmanned Air Vehicle

Military Development Perspective

By: Leo M. Almazan
DOST Balik-Scientist

Bio/Resume

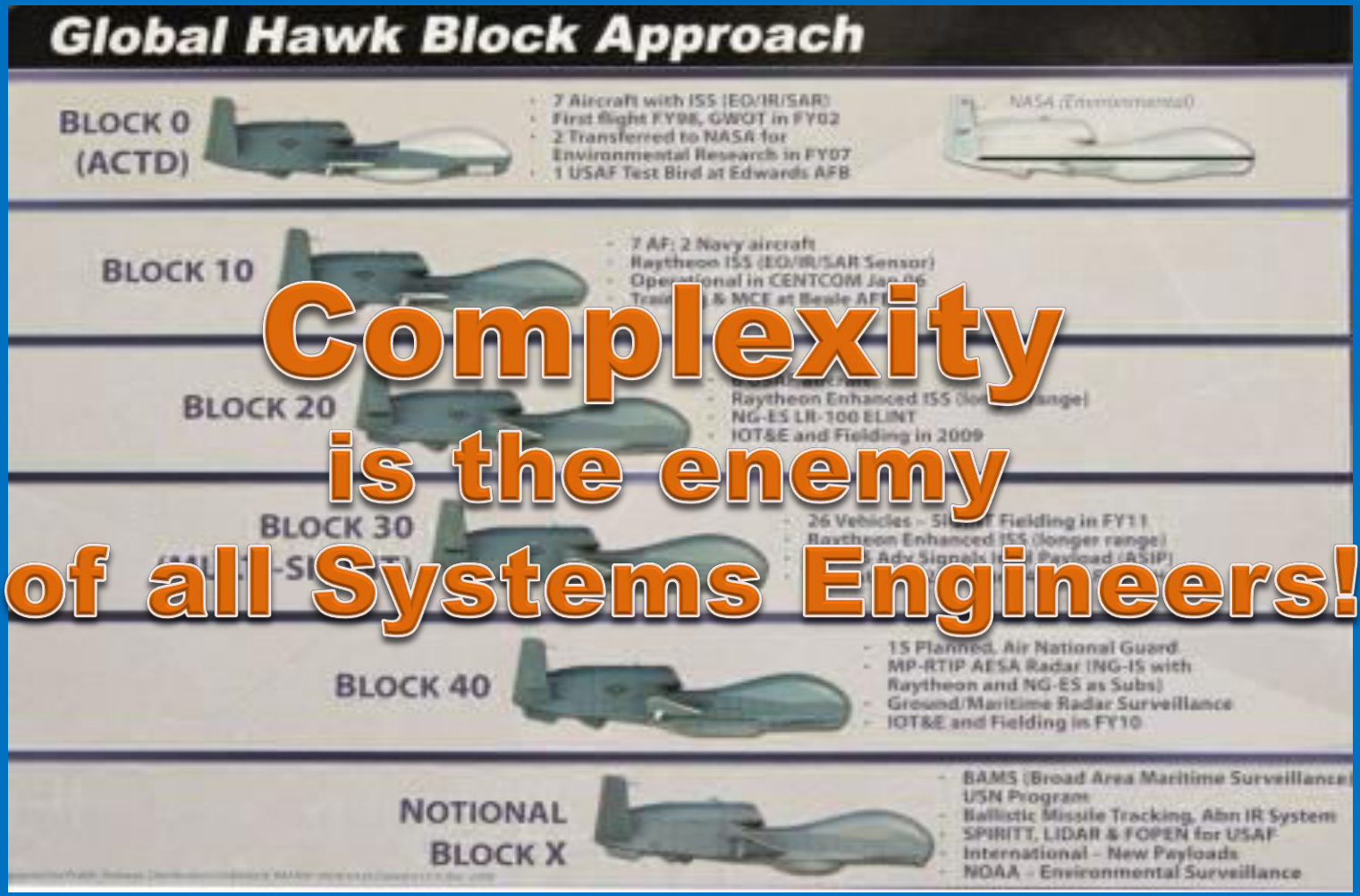
- DOST Balik-Scientist



- SPAWAR

- USN (Naval Aviator)

Development Approach

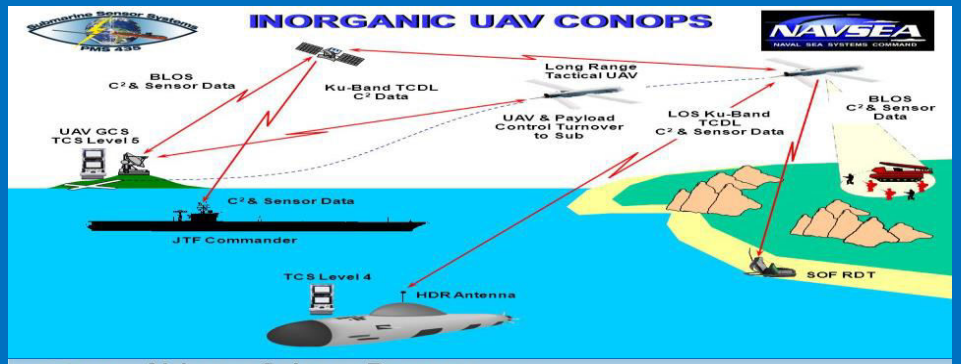


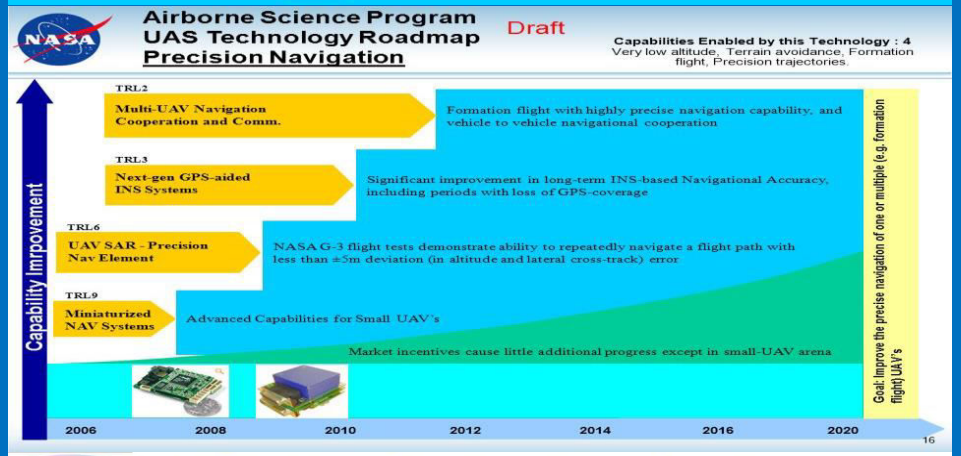
Complexity is the enemy of all Systems Engineers!

Use DOD Model in development by phases

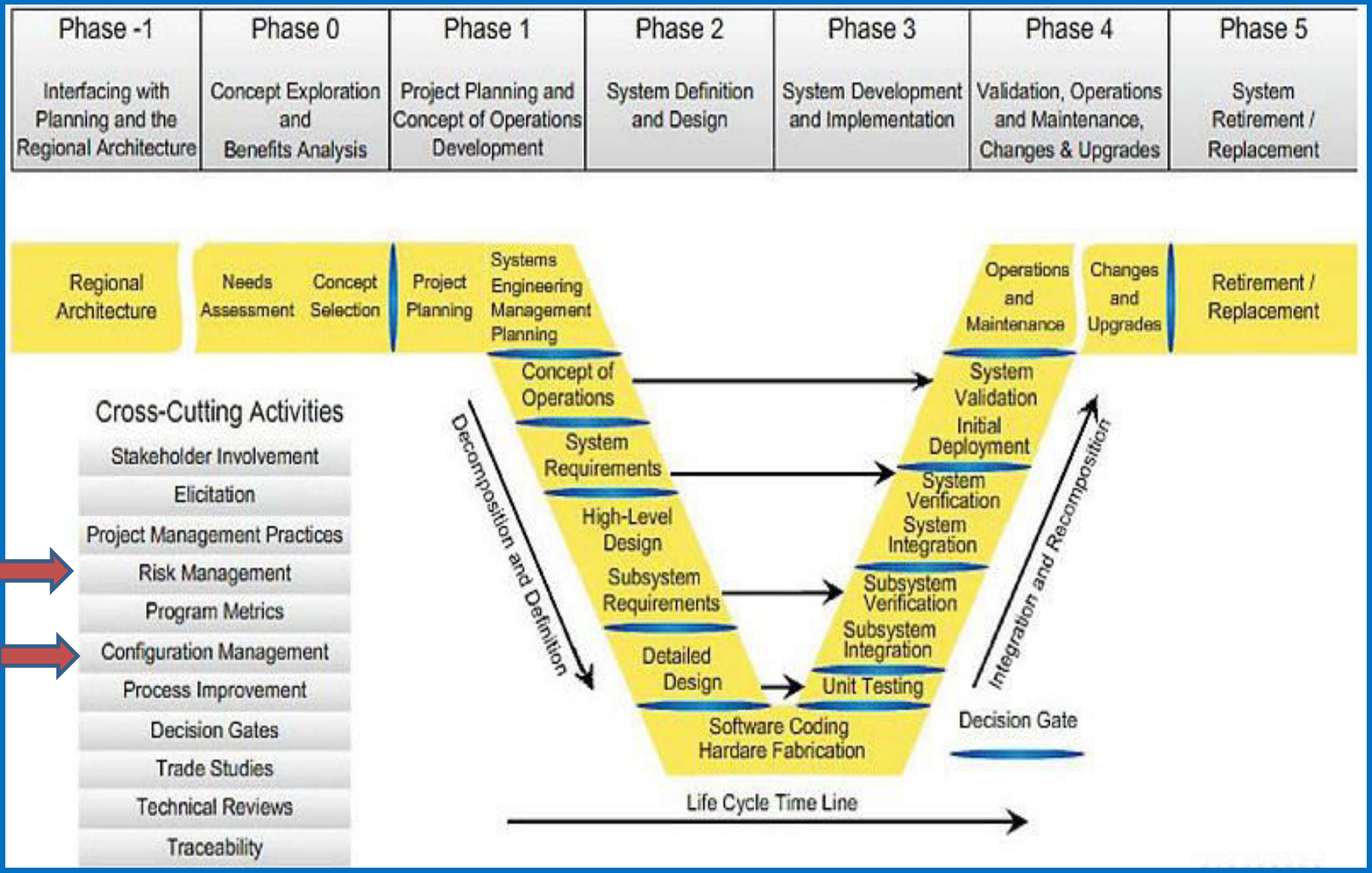
MUAV Development Plan

- CONOPS
- Roadmap
- Organization





DoD Development Cycle



Type of Military UAV

Classes of UAV

Class I < 150 kg

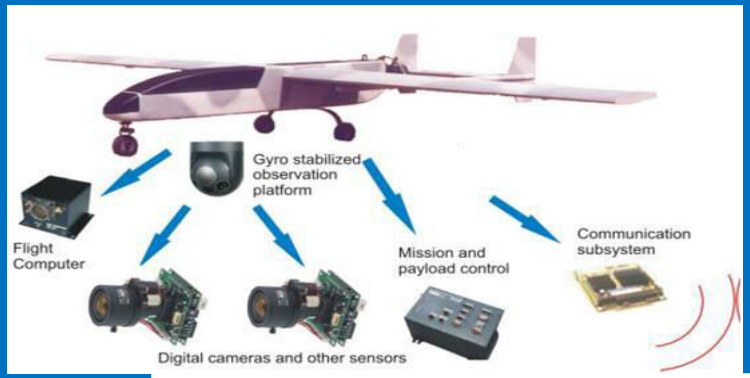
Class II (150-600 kg)

Class III (> 600 kg)

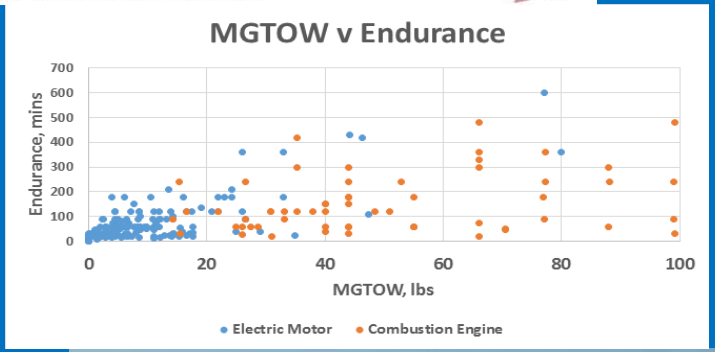
Military UAV

MUAV should address the following:

- **Payload**



- **Endurance**



- **Capabilities**

Military UAV Capabilities

"The introduction of UAVs into the battlespace enables impressive new operational capabilities for any military forces across the operational mission spectrum. "

Quadrennial Defense Review 2007

These capabilities can be categorized in the (3) broad mission-area types:

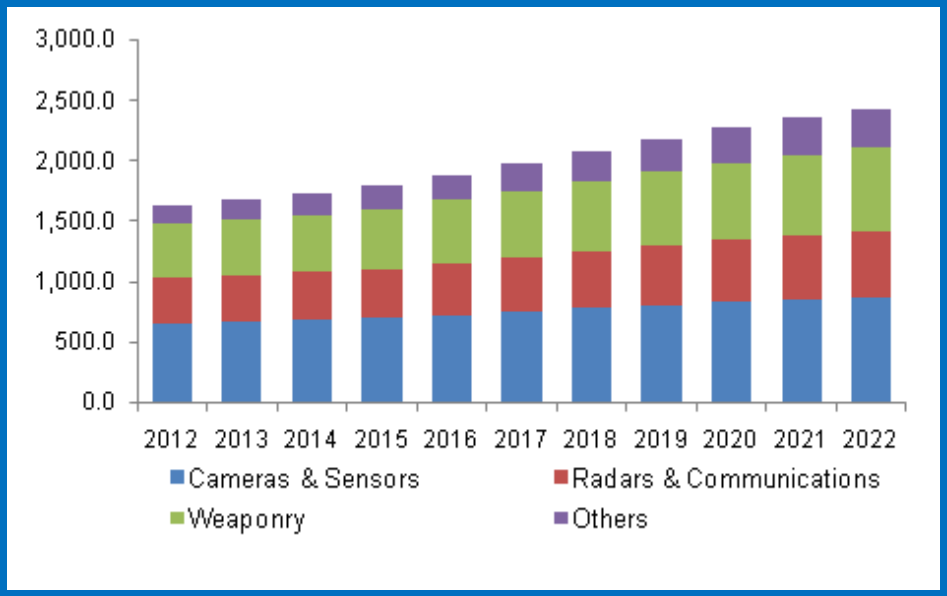
- ***ISR***
- ***Strike***
- ***Combat Support***

MUAV Payload

A *payload* is the cargo or equipment a vehicle carries that is not required for flight, control and navigation

Army UAV Payload Priorities "Top 5"

TUAV (Bde)	TUAV (Div/Corps)	Predator	Global Hawk
EO/IR	EO/IR	EO/IR	SAR/MTI
SAR/MTI	SAR/MTI	SAR/MTI	EO/IR
CRP	CRP	CRP	SIGINT
HSI/USI	HSI/USI	HSI/USI	ACN
LRF/LD	LRF/LD	SIGINT	HSI/USI



MUAV Development Objectives

The first objective of any militarized UAV is to satisfy military needs by providing a platform capability within their mission requirement time frame

The second objective is to develop a CONOPS for a baseline UAV in general. Program development stresses COTS system integration in order to meet its low cost requirement. Off-the-shelf EO, IR, SAR, navigation, systems, engines, and basic aircraft design integrated to produce an advance military grade UAV

Military UAV Issues

UAV operations depend on secure reliable comms. Although autonomy and other technology developments can minimize communications bandwidth requirements, large BW is still required for downlink communication, sensor data, HD imageries and information regarding the UAV's status, position, and system's health.

Although continued system and technology development is expected to make progress in this area, the issue itself will not go away. Continued attention to this subject, therefore, is essential

Military UAV Issues

- ***Competition with legacy and other new systems for funds.*** **As a relatively new type of military weapon system, UAVs are in competition for funds with new and traditional systems**

- ***The program start-stop-start syndrome.*** **The unfortunate practice of starting a military program and then, when IOC is about to commence, canceling it in favor of a supposedly more promising "pet" project, has plagued the AFP UAV procurements for years. Each such sequence adds years of delay in equipping the operating forces with UAVs.**

Military UAV Issues

Reluctance of one military Service to use the UAV system of another. **This is the "not invented here" syndrome, it is an understandable characteristic of some validity. A commander feels most secure in owning and completely controlling a system that is fundamental to accomplishing the service's mission.**

But there are obvious cost and operational advantages for the AFP if multi-service use can be achieved—overall system development costs are reduced, and UAV force levels can be increased more rapidly

Military UAV Issues

EMC/RFI

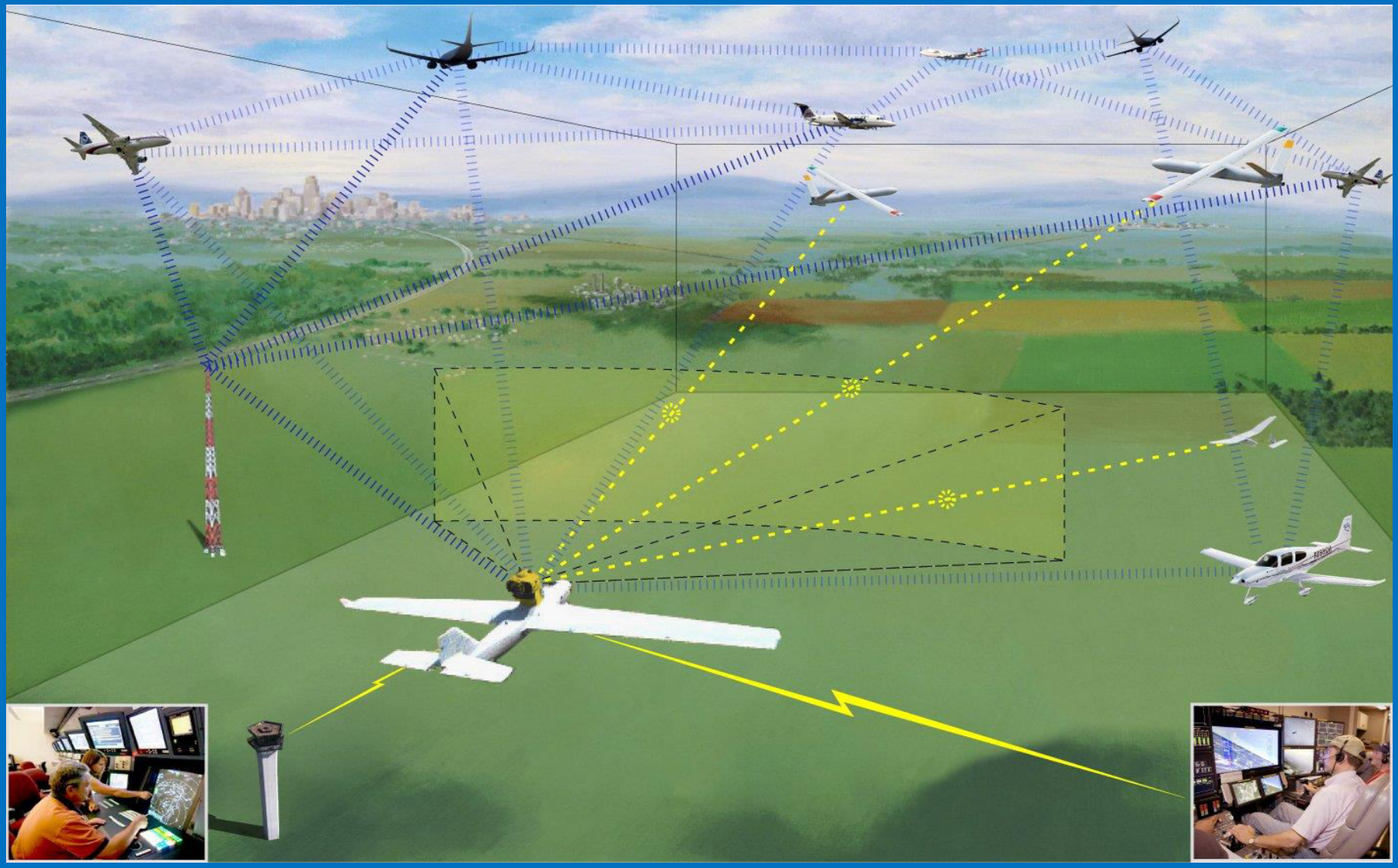
- ***With the proliferation of the high speed devices that synchronize modern digital circuits, an increase in their switching speeds and lower circuit voltages, increasing susceptibility RFI is greater***

- ***EMC increasingly became a source of concern. The US DoD became aware of EMC as a growing problem and issued directives to the manufacturers of digital electronic equipment, which set out the essential manufacturer requirements before their equipment could be sold to the DoD***

Military UAV Issues

- **MIL-STD-461B- MILITARY STANDARD: ELECTROMAGNETIC EMISSION AND SUSCEPTIBILITY REQUIREMENTS FOR THE CONTROL OF ELECTROMAGNETIC INTERFERENCE (01 APR 1980).,** ***This standard covers the requirements and test limits for the measurement and determination of the electromagnetic interference characteristics (emission and susceptibility) of electronic, electrical and electromechanical equipment. The requirements shall be applied for general or multi-service procurements and single service procurements, as specified in the individual equipment specification, or the contract or order.***

UAV & National Air Space



UAV & National Air Space

Autonomous Flight Systems Laboratory

Aeronautics & Astronautics

UNIVERSITY OF WASHINGTON

A Risk Based Paradigm and Model for Unmanned Aerial Systems in the National Airspace

Christopher Lum	University of Washington
Blake Waggoner	Missile Defense Agency
Kristoffer Gauksheim	University of Washington
Juris Vagners	University of Washington
Tad McGeer	Aerovel

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2011 AIAA Infotech@Aerospace Conference
St. Louis, MO

Way Forward

- *Adhoc Committee: Composed of AFP and DND Representatives*
- *Draft of Joint Memorandum of Agreements between all Services*
- *Draft MOA with DOST*
- *Develop a Joint Military CONOPS*
- *Develop a Joint Military UAV Development Plan/Roadmap*
- *Create a UAV R&D Branch within each Services R&D Centers*

Questions???