

Unmanned Aircraft Systems Present & Future Capabilities



Major General Blair Hansen
23 October 2009

This briefing is classified
UNCLASSIFIED



Overview

- Why Unmanned Aircraft Systems
- Evolution of Capabilities
- Growing Demand
- Emerging Missions
- Challenges
- Vision



Why Unmanned Aircraft Systems?

- Persistence - ability to loiter over a target for long time periods for ISR and/or opportunity to strike enemy target
- Undetected penetration / operation
- Operations in dangerous environments
- Can be operated remotely, so fewer personnel in combat zones - projects power without projecting vulnerability
- Integrates “find, fix, finish” sensor and shooter capabilities on one platform



RQ-11 Raven



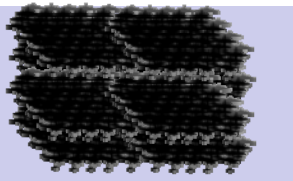
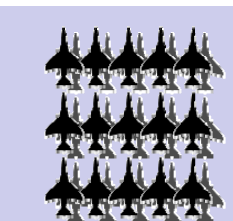


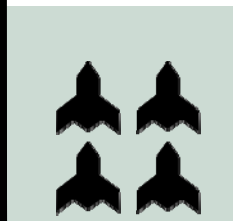

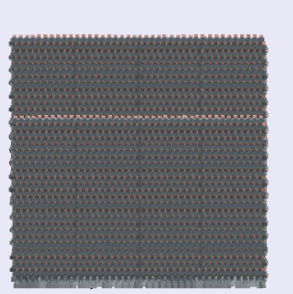




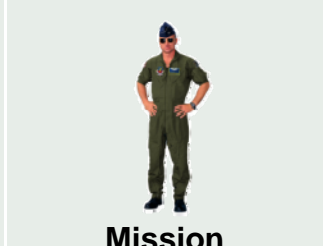






Reaper



RQ-8 Fire Scout



Evolution of Capabilities

	WWII	Vietnam	Gulf War	OIF/OEF	Near Future	Distant Future
Planes	 1,000 planes (B-17)	 30 planes (F-4)	 1 plane (F-117)	 1 plane (F-16)	 4 planes (MQ-X)	 Swarm (Autonomous UAS)
People		 60 crew	 1 crew	 1 crew	 1 crew	 Mission Commander
Targets	 1 Target	 1 Target	 2 Targets	 6 Targets	 32 Targets	 ??? Targets
Tech	Mass Aircraft	Tactical Strike	Laser Munitions	GPS Munitions	MAC	Collaboration
C2	In-the-Loop	In-the-Loop	In-the-Loop	In-the-Loop	On-the-Loop	Out-of-the-Loop
Mgmt	Active	Active	Active	Active	Responsive	Passive



Family of Systems

Nano
 Navigate / communicate
 inside buildings



Nano

Bio-Mechanicals
 - Indoor Reconnaissance
 - Indoor Lethal/Non-lethal
 - Indoor Comm
 - Cyber attack
 - Swarming



Micro
 Close-in reconnaissance
 & situational awareness



Wasp III

"SUAS Family of Transformers"
 - Personal ISR
 - Lethal
 - SIGINT
 - Cyber/EW
 - Counter-UAV
 - AutoSentries



Lite Machine's Conceptual SUAS

Man-portable
 - ISR
 - Time-Sensitive
 - Lethal

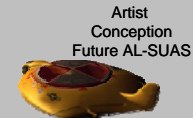


Raven B

Irregular Warfare

Increasing across all mission sets

Family of Expendables
 - Close-In ISR
 - Expendable Jammers
 - Lethal
 - Counter Air
 - Precision Clandestine Resupply
 - Cyber attack



Artist Conception Future AL-SUAS

Air-Launched
 - Close-in ISR
 - Lethal
 - SIGINT/DF



Switchblade SUAS
 Technical Demonstration

Anti-Access Support

Multi-Mission
 - ISR
 - Force protection
 - FID



FINDER SUAS



Voyer SUAS
 Technical Demonstration



GT Aero Conceptual Bandit SUAS

Tier II Joint
 - ISR
 - Comm Relay
 - Lethal
 - SIGINT

Next Gen Multi-Mission
 - ISR
 - Communications Relay
 - Lethal / Non-lethal
 - Electronic/Cyber Attack/SEAD
 - SIGINT/Low Altitude Pseudo-Sats
 - = New Mission areas





...We must take a joint approach to:

Get the most out of UAS to increase joint warfighting capability, while promoting service interdependency and the wisest use of tax dollars

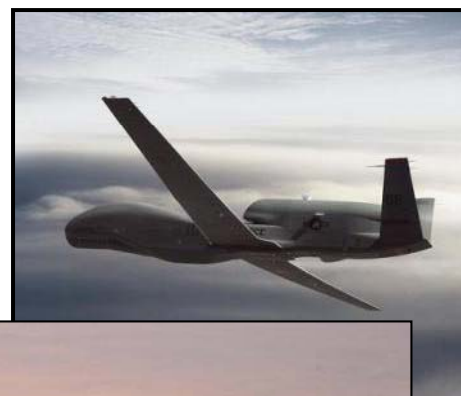
Requires:

- Optimal joint concept of operations (CONOPS)
- Airspace control resulting in safe / effective UAS operations
- Air defense architecture to achieve security w/o fratricide
- Acquisition effectiveness, efficiency, standardization



Principles of UAS Evolution

- Automation is key
- Modularity = flexibility
- UAS is compelling where the human is a limitation to mission success
- Seamless manned and unmanned systems integration
- “Integrated Systems” approach
- Robust, agile, redundant C2 enables supervisory control (“man on the loop”)
- Solutions are linked and must be synchronized



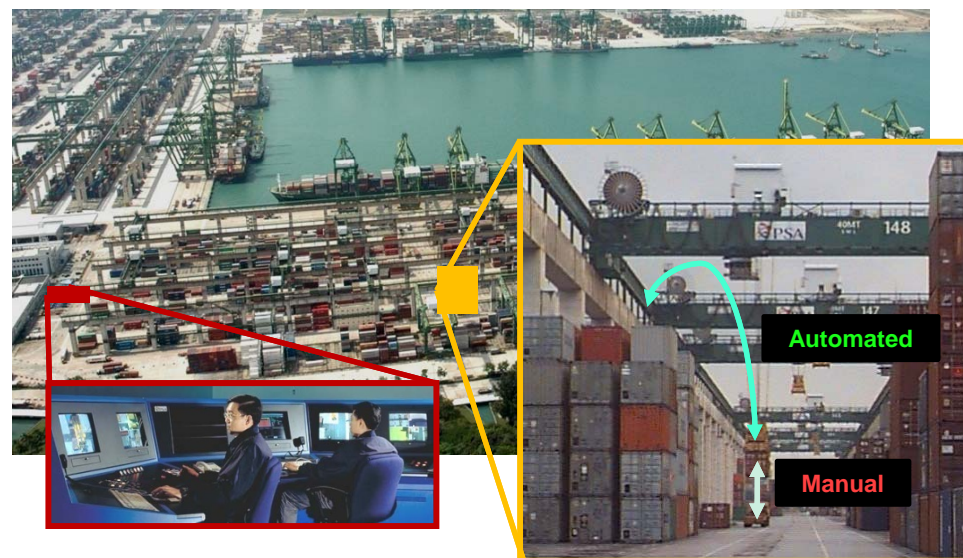


Autonomy



Conventional Harbor

- 4 operators per crane
- Manpower-centric system
 - Legacy system
 - Manpower dependant
 - Manual Operation



“Multi-Crane Control”

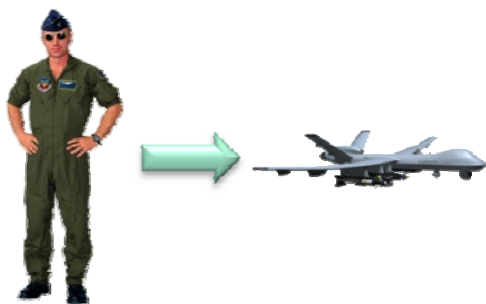
- 1 operator per 6 cranes
- 24x increase in efficiency
- Tech-centric system
 - Multi-crane Control
 - Automation (cranes and AGV)
 - DGPS
 - Algorithms



Autonomy – Multi-Aircraft Control Potential Manpower Savings

2011
(Current system)

- 50 CAPs
 - 50 MQ-9 CAPs
 - + 7 a/c in constant transit
 - 10 pilots per CAP
 - 500 pilots required
 - + 70 pilots to transit a/c
- 570 Total Pilots**



2012
(MAC)

- 50 CAPs
 - 50 MQ-9 CAPs
 - 2 CAPs per MAC GCS
 - 1 transit per MAC GCS
- 5 pilots per CAP
 - 250 Pilots required
 - + 0 to transit aircraft

250 Total Pilots

56% Manpower Savings



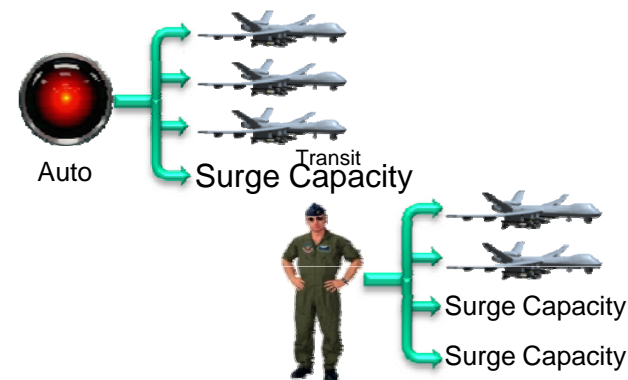
MAC = 1 pilot can fly up to 4 a/c

TBD
(MAC + 50% auto)

- 50 CAPs
 - 50 MQ-9 CAPs on orbit
- 25 CAPs automated
- 25 CAPs in MAC (5 pilots/CAP)
 - 125 pilots required
 - + 25 auto-msn monitor pilots
 - + 0 to transit aircraft

150 Total Pilots

64% Manpower Savings

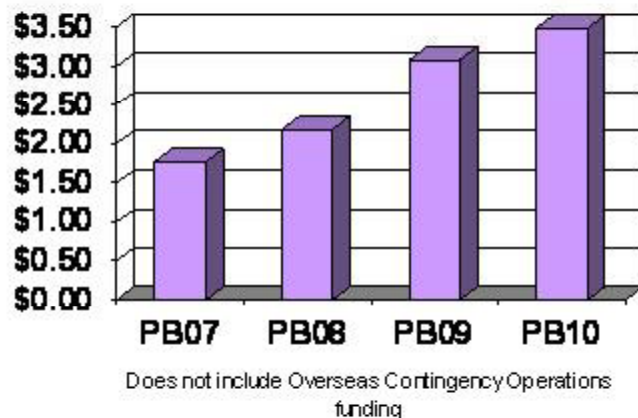




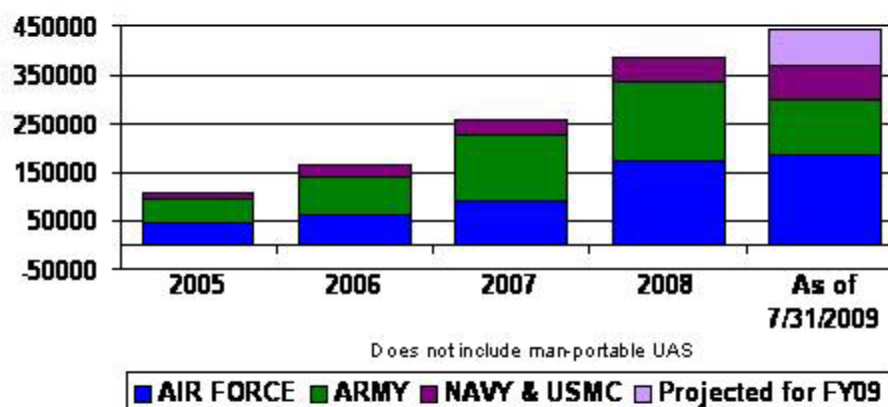
Unmanned Aerial Systems Growth

- Overwhelming demand for persistent ISR has driven significant DoD investment in UAS
 - Over 2,000 UAS aircraft deployed to Iraq and Afghanistan
 - \$ 3.5B investment in PB10
 - Over 450K flight hours in FY09
 - Light-weight, low altitude UAS account for preponderance of growth

UAS Investment



DoD UAS Flight Hours





Anticipated growth within CONUS

Planned 2013 DOD UAS bed down

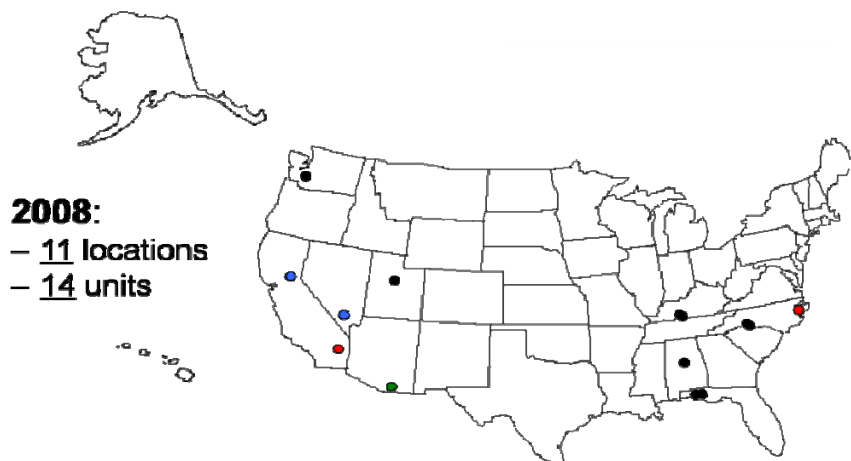
- 113 CONUS locations
- 1.1 million UAS flight hrs for *initial/continuation training*
- 91% of airspace is **Class E&G**

Service	# Base/ Posts	# UA	# Troops	Airspace Class (1000 Hrs/Yr)							Total
				A	B	C	D	E	G	Restricted	
Army	84	4066	3521	0	0	0	17.1	110.8	284.6	5.2	417.7
Air Force	9	96	1140	51.8	0	1.6	4.4	17.3	0	5.1	80.2
Navy*	0	9	24	0	0	0	0	0	0	0	0
Marine Corps	18	1401	1134	0	0	0	2.1	10.3	67.1	0.8	80.3
SOCOM	41	1364	4465	9.9	0	0	4.7	25.9	499.6	7.4	547.5
Total:				61.7	0	1.6	28.3	164.3	851.3	18.5	1.1M
% of Use:				5%	0	0%	2%	15%	76%	2%	Hrs

* Navy Programs of Record still in Development and Test phases in 2013

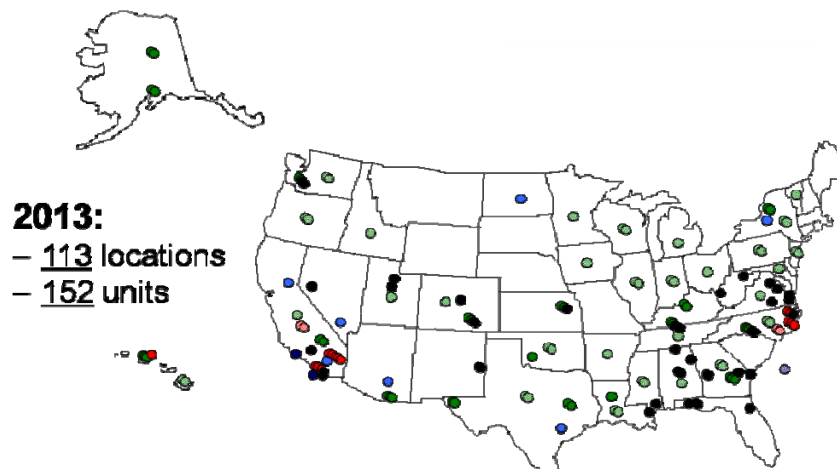
Manned Aircraft Annual Training Hours (Worldwide in FY07):

Army	405K Hrs
Air Force	1,700K Hrs
Navy / Marine Corps	1,167K Hrs
SOCOM	103K Hrs
TOTAL	3.3M Hrs



2008:
 - 11 locations
 - 14 units

● Army ● Air Force ● Navy ● Marines ● SOCOM ● State ID'd but Post TBD

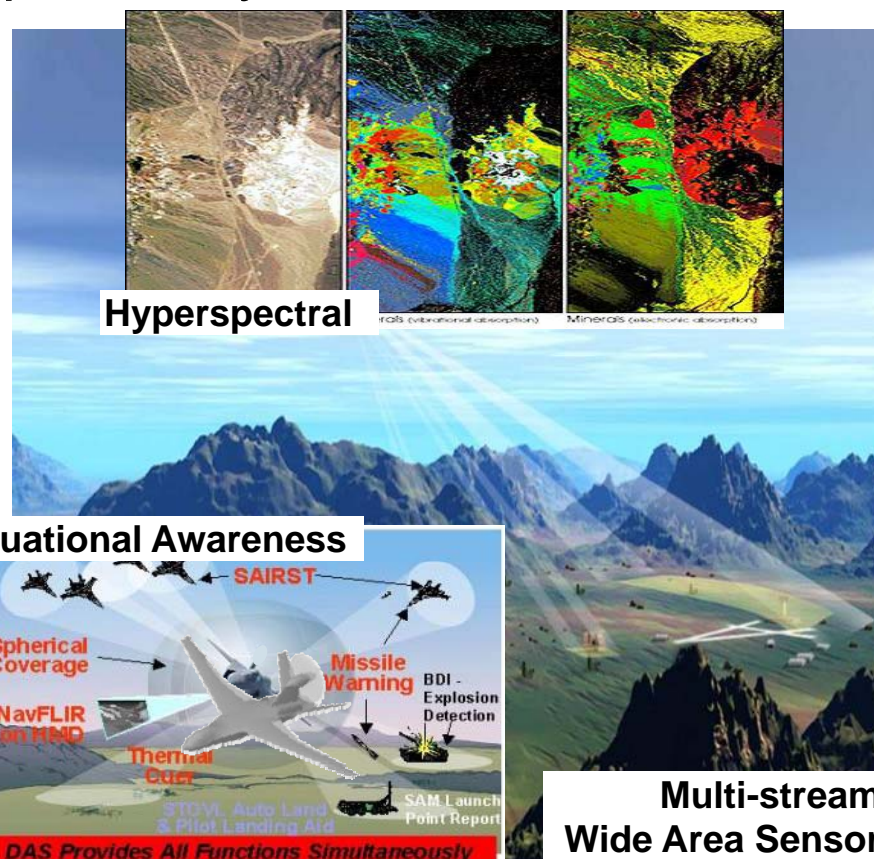
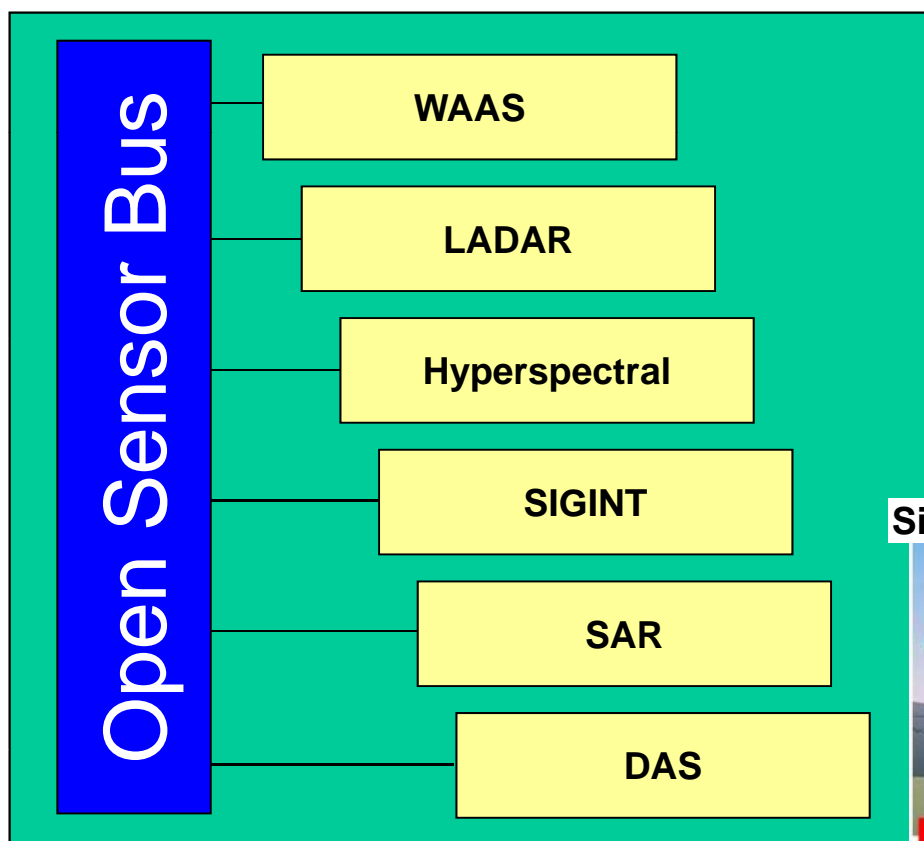


2013:
 - 113 locations
 - 152 units



Emerging UAS Missions - Advanced ISR Capabilities

Open architecture allowing modular sensors to be integrated quickly and inexpensively

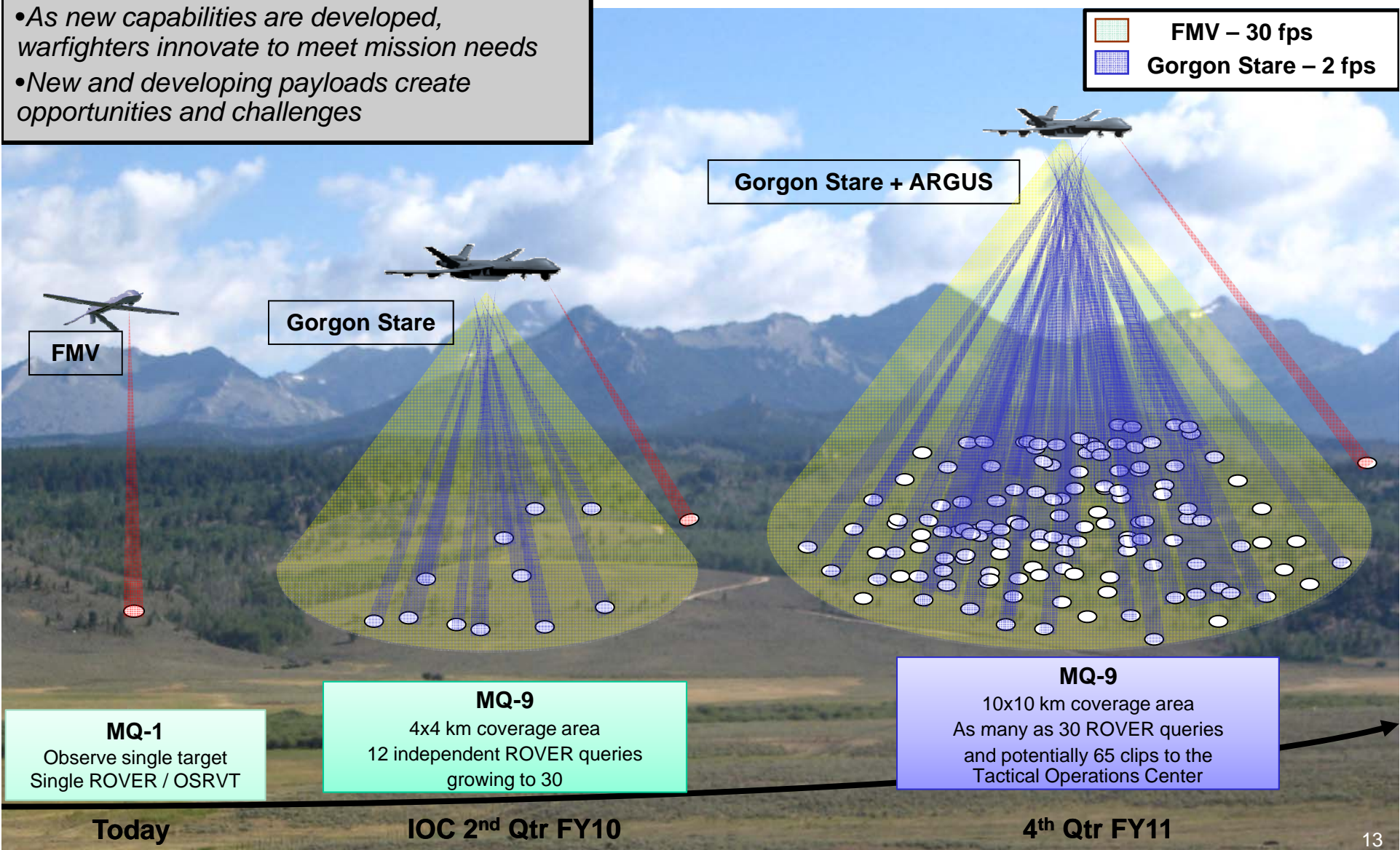




Wide Area Airborne Surveillance (WAAS)

- As new capabilities are developed, warfighters innovate to meet mission needs
- New and developing payloads create opportunities and challenges

	FMV – 30 fps
	Gorgon Stare – 2 fps



FMV

Gorgon Stare

Gorgon Stare + ARGUS

MQ-1
Observe single target
Single ROVER / OSRVT

MQ-9
4x4 km coverage area
12 independent ROVER queries
growing to 30

MQ-9
10x10 km coverage area
As many as 30 ROVER queries
and potentially 65 clips to the
Tactical Operations Center

Today

IOC 2nd Qtr FY10

4th Qtr FY11



Analytical Challenges – Data ≠ Knowledge

- Tasking Processing, Exploitation and Dissemination (TPED)
 - Capabilities have not kept pace with platform growth
- Data Standards and Interoperability
 - Sufficient interoperability does not exist between platforms and TPED architectures
- Communications Architectures
 - Growth of UAS platforms and intelligence capabilities has driven significant frequency spectrum demand





Vision for an unmanned future

- Automated control and modular “plug-and-play” payloads
- Airspace integration/deconfliction – addressing both cultural and technical challenges
- Joint UAS solutions and teaming
- Automated exploitation capabilities
- Technology to address bandwidth concerns
- An informed industry and academia – knowing where we are going and what technologies to invest in



Today's UAS deliver a game-changing capability

A single air vehicle provides the ability to find, fix, and finish targets!



Unmanned Aircraft Systems Present & Future Capabilities



Major General Blair Hansen
23 October 2009

This briefing is classified
UNCLASSIFIED

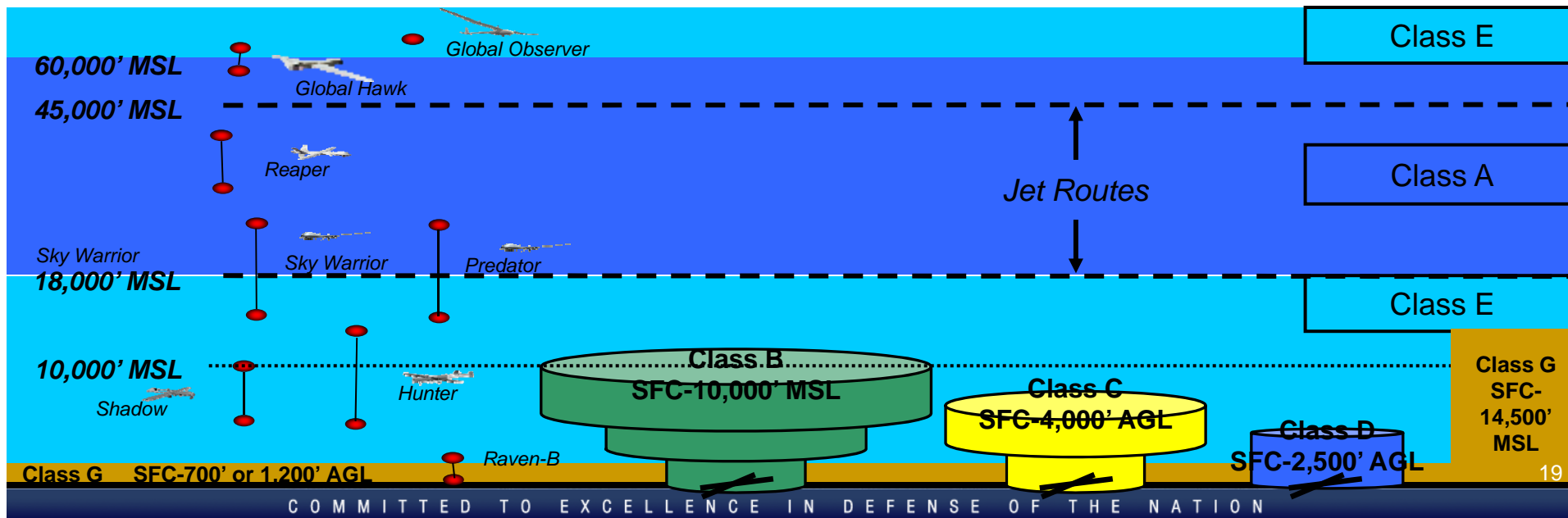
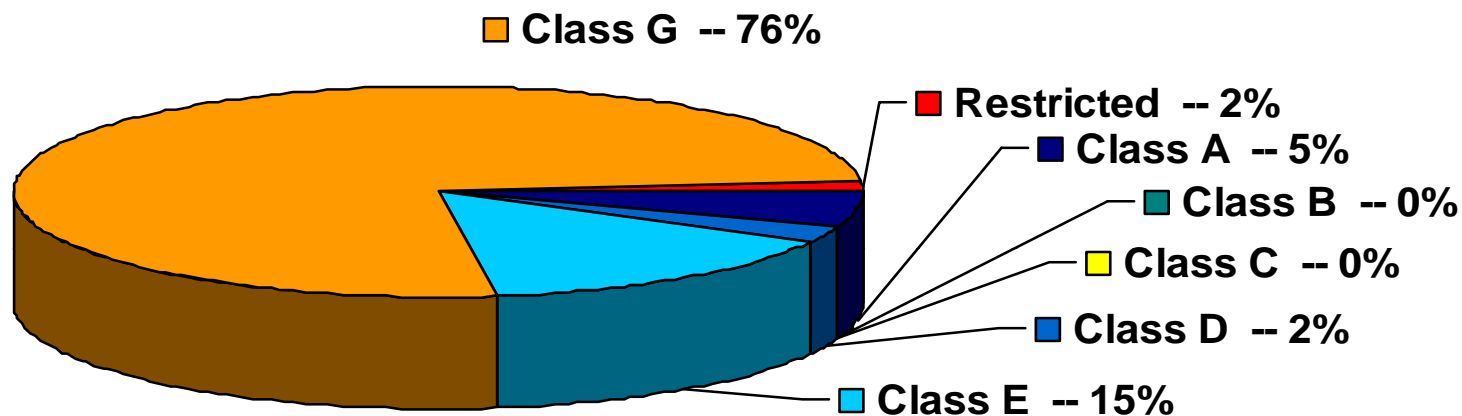


Back up slides



The Operational Demand by Airspace Class

Percent of 1.1M Hours





UAS Classification

- **Joint Classification scheme developed to facilitate consensus on regulations, standards and certification**
- **Utilized at all echelons and levels within combat theaters**

UAS Category	Maximum Weight (lbs) (MGTOU)	Normal Operating Altitude	Speed (KIAS)	Current/Future Representative UAS
Group 1	0-20	<1,200 AGL	<250	WASP III, BATCAM, Raven, Dragon Eye
Group 2	21-55	<3,500 AGL		Scan Eagle
Group 3	<1320			Silver Fox, Shadow, Neptune,
Group 4	>1320	<18,000 MSL	Any Airspeed	Predator, Sky Warrior, Hunter, Fire Scout
Group 5		>18,000 MSL		Global Hawk, Reaper, BAMS, Global Observer, N-UCAS



UAS – an alternative to a range of traditionally manned systems

- Deeply modular and upgradable
 - Support future roles and mission needs
- Size, Weight and Power
 - Maximize sensor & weapons flexibility
- High subsonic dash
 - Force packaging and responsiveness
- Target area persistence
- Survivable in contested environment

