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?

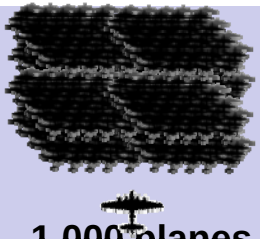
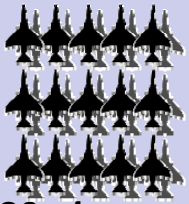
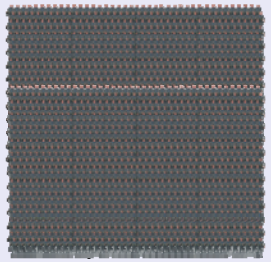
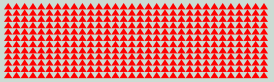
- Persistence - ability to loiter over a target for long time periods for ISR and/or opportunity to strike enemy target
- Undetected penetration / operation
- Operations in dangerous environments
- Can be operated remotely, so fewer personnel in combat zones - projects power without projecting vulnerability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

RQ-11 Raven

Reaper

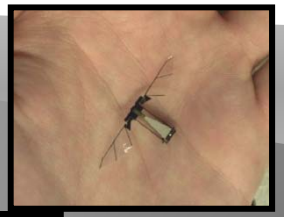
RQ-8 Fire Scout

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



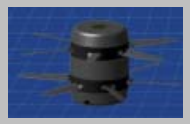
Nano

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

Irregular Warfare

Man-portable
- ISR
- Time-Sensitive
- Lethal

Raven B

Increasing across all mission sets

Switchblade SUAS
Technical Demonstration

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

Finder SUAS

Anti-Access Support

Voyeur SUAS
Technical Demonstration

Multi-Mission
- ISR
- Force protection
- FID

Scan Eagle

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

GT Aero Conceptual Bandit SUAS

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

Now → **Future**

…We must take a joint approach to:

Get the <u>most</u> out of UAS to <u>increase</u> 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"

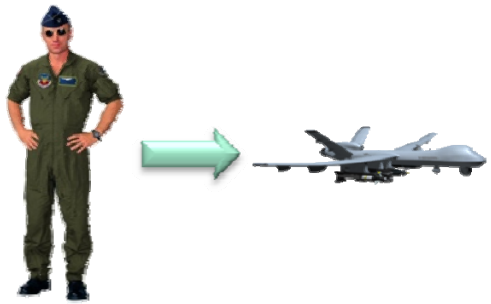
- 1 operator per 6 cranes
  - 24x increase in efficiency
- Tech-centric system
  - Multi-crane Control
  - Automation (cranes and AGV)
    - DGPS
    - Algorithms

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

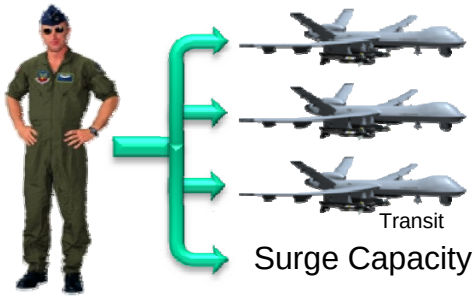


2012
(MAC)

- 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



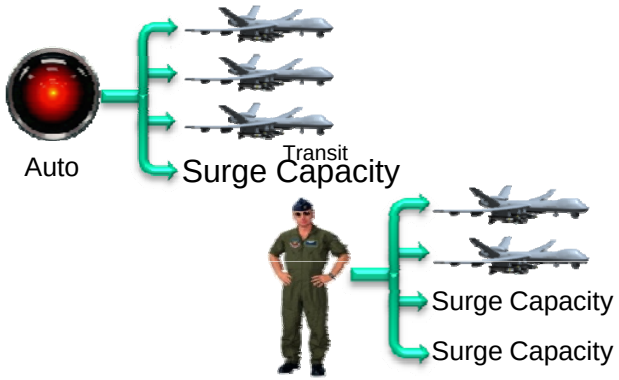
MAC = 1 pilot can fly up to 4 a/c

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

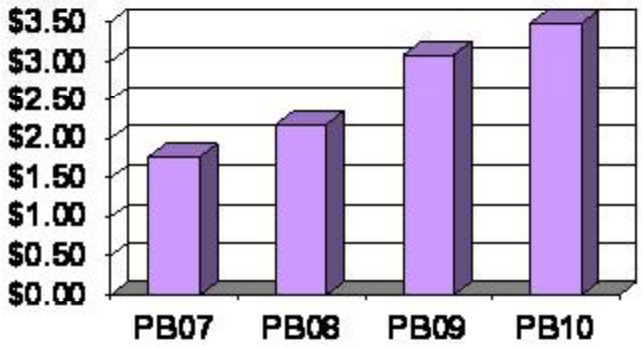
64% Manpower Savings



Unmanned Aerial Systems Growth

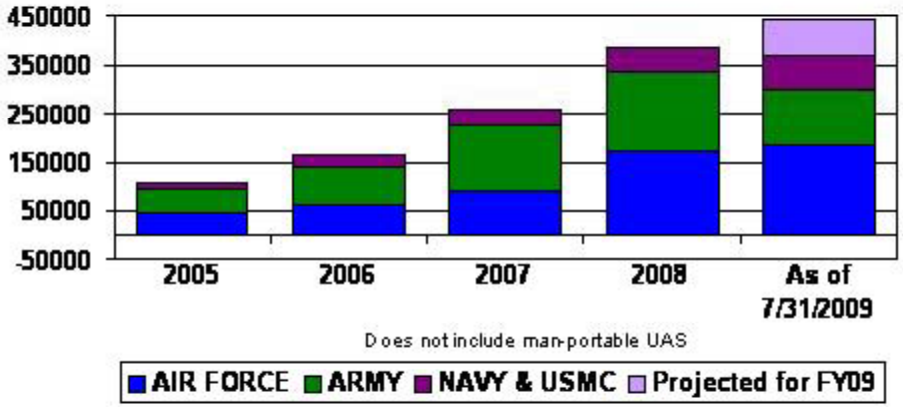
- Overwhelming demand for persistent ISR has driven significant DoD investment in UAS
  - Over 2,000 UAS aircraft deployed to Iraq and Afghanistan
  - $ 3.5B investment in PB10
  - Over 450K flight hours in FY09
  - Light-weight, low altitude UAS account for preponderance of growth

UAS Investment



Does not include Overseas Contingency Operations funding

DoD UAS Flight Hours



Anticipated growth within CONUS

Planned **2013** DOD UAS bed down

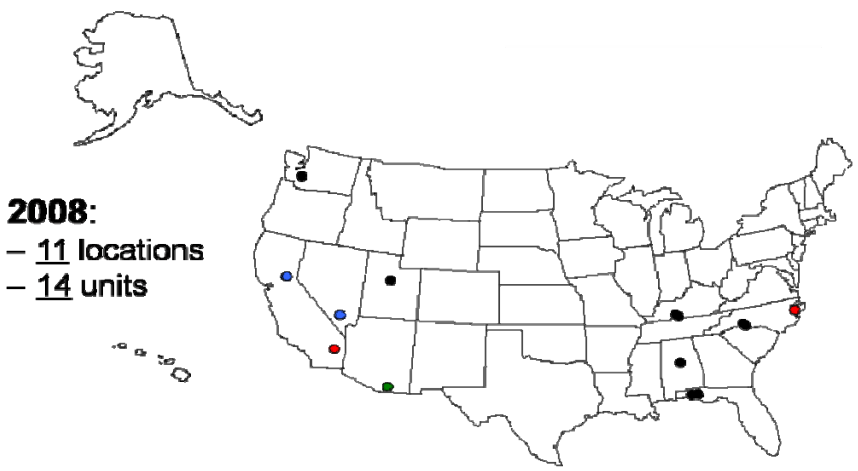
- **113 CONUS locations**
- **1.1 million UAS flight hrs for** *initial/continuation training*
- **91%** of airspace is **Class E&G**

Service	# Base/ Posts	# UA	# Troops	Airspace Class (1000 Hrs/Yr)							
				A	B	C	D	E	G	Rest-ricted	Total
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:	152	6936	10284	61.7	0	1.6	28.3	164.3	851.3	18.5	1.1M Hrs
% of Use:				5%	0	0%	2%	15%	76%	2%	

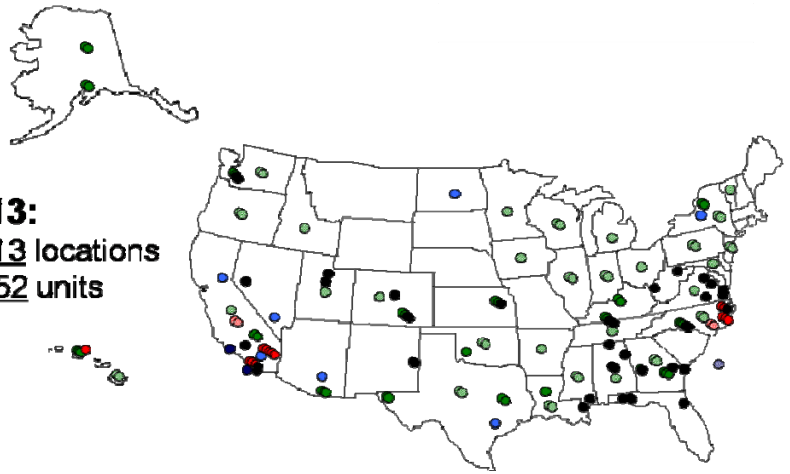
* Navy Programs of Record still in Development and Test phases in 2013

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

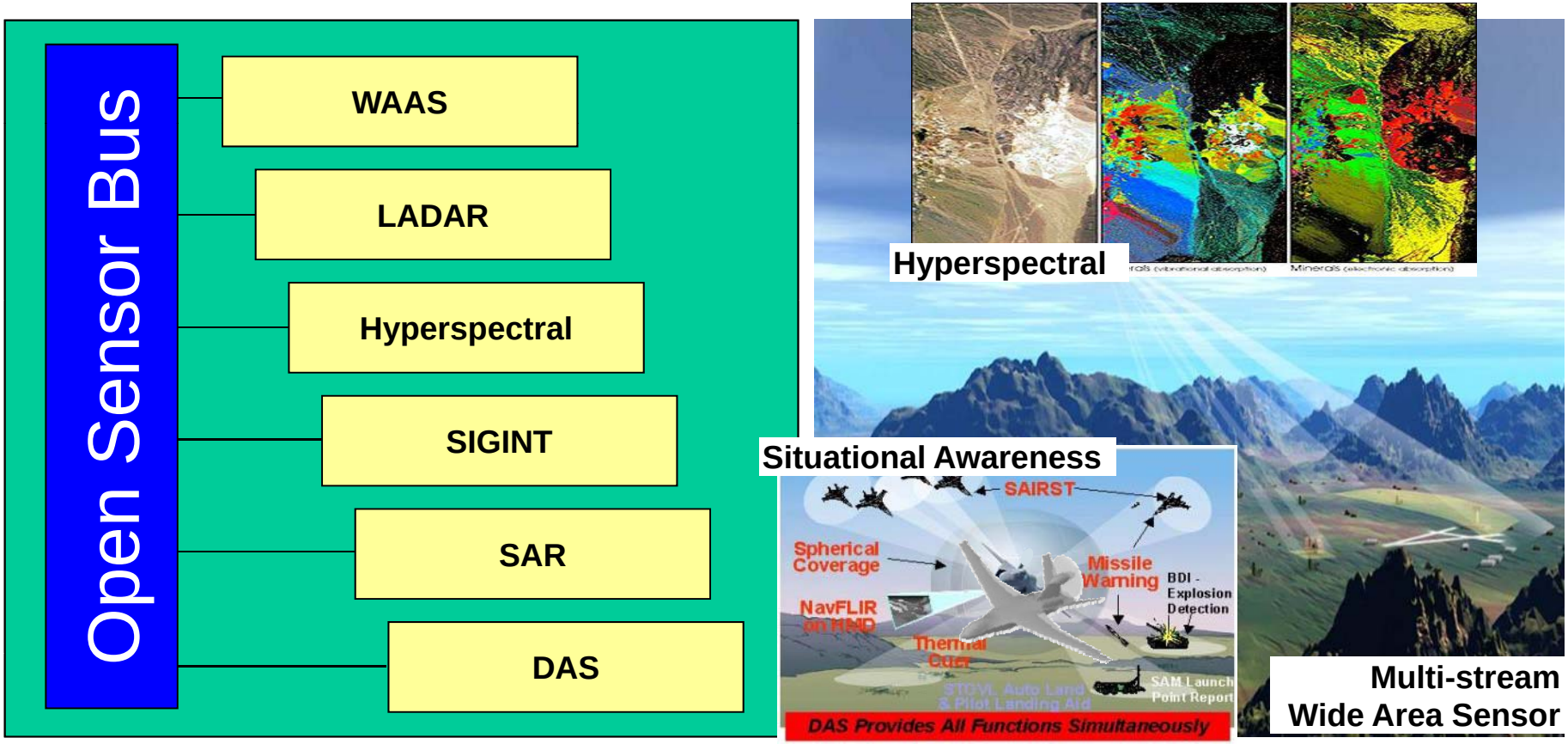


2013:
– 113 locations
– 152 units

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

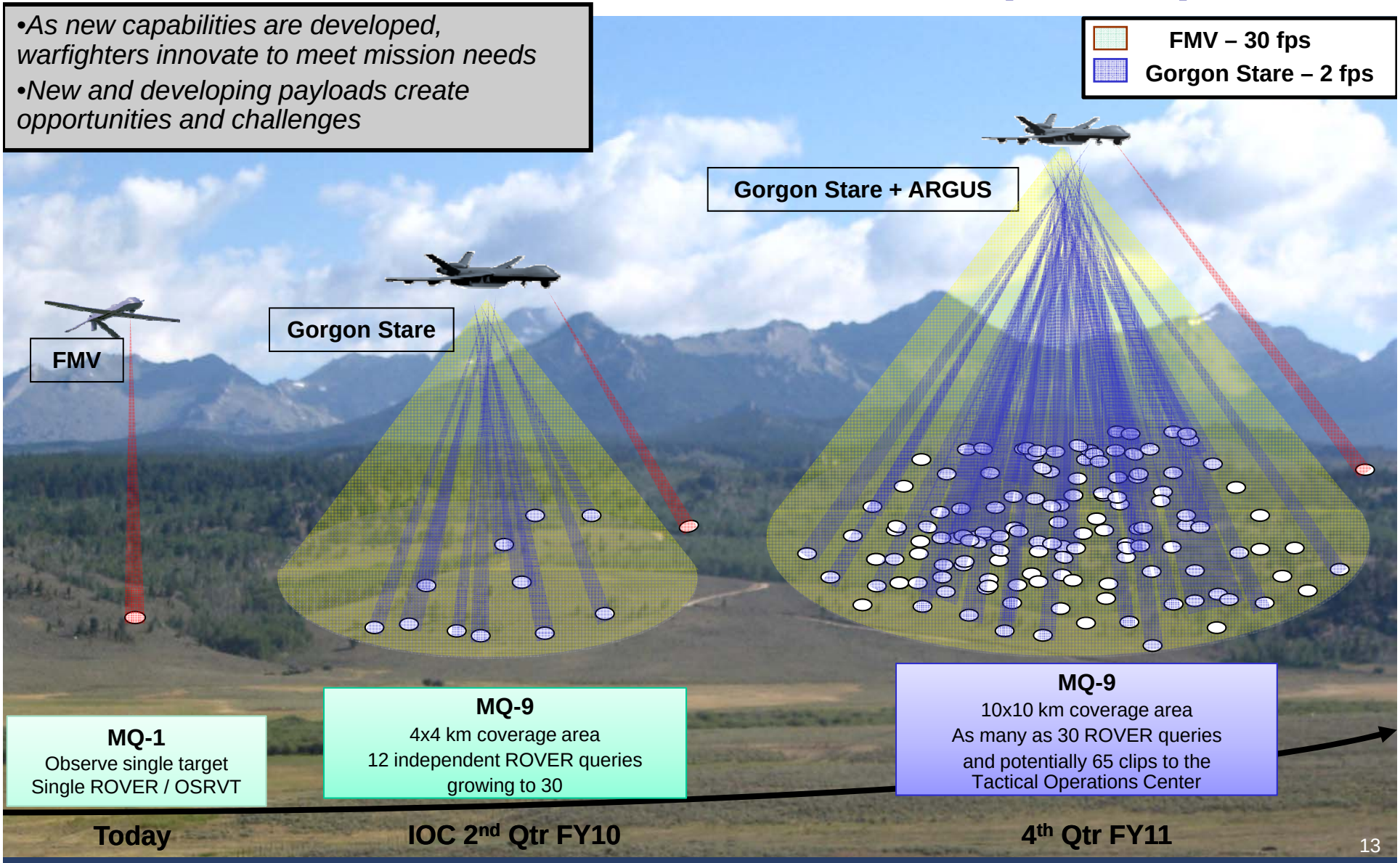
Emerging UAS Missions - Advanced ISR Capabilities

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*



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

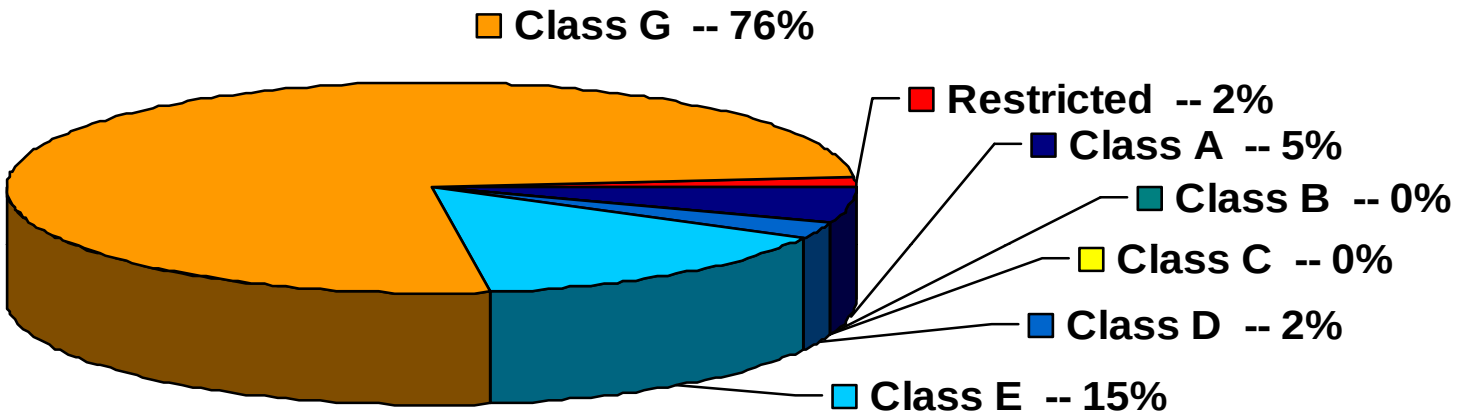
23 October 2009

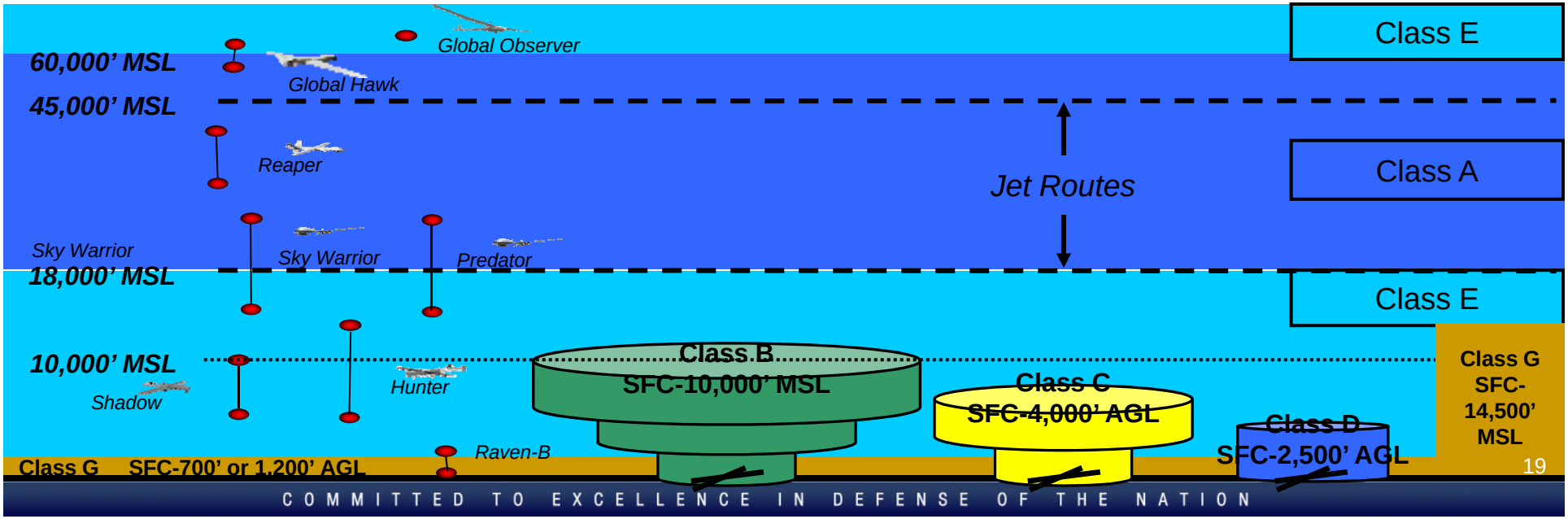
This briefing is classified
UNCLASSIFIED

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) (MGTOW)	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**	**<18,000 MSL**		**Silver Fox, Shadow, Neptune,**
Group 4	**>1320**		**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