

日本安全保障貿易学会 第17回研究大会
第2セッション:無人化技術と輸出管理

無人自動兵器の拡散と戦争の変化

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Unmanned Aircraft Systems

Mission Areas

2011

Increasing Reach, C2, Autonomy, & Complexity

2035+

Increasing Performance, Payload, & Vehicle Size

Strike Capable
ISR / Data Relay Platforms

Long Endurance

Group 5
• > 1320 lbs
• > FL180

Air Force
MQ-9
Reaper



Air Force RQ-4 Global Hawk
Navy MQ-4 BAMS



Air Force MQ-La/b



Air Force MQ-X



Air Force MQ-Lc



Persistent

Group 4
• > 1320 lbs
• < FL180

Army
MQ-5
Hunter



Army MQ-1C Gray Eagle



Navy UCAS-D



Army / Navy / USMC
VTOL

Navy UCLASS



*Navy UCAS
FAA-XX*



Air Force MQ-1 Predator



Navy MQ-8
Fire Scout



Navy MRMUAS



Tactical

Group 3
• < 1320 lbs
• < FL180
• < 250 kts

Army / USMC / SOCOM
RQ-7 Shadow



SOCOM
EUAS
(VTOL)
SOCOM
EUAS
(FW)



Navy / USMC
RQ-21A
STUAS

Black: Programs of Record
Red: Future concepts

Small Tactical

Group 2
• 21-55 lbs
• < 3500 AGL
• < 250 kts

Navy / USMC/
Air Force /
SOCOM
ScanEagle



Micro/Mini Tactical

Group 1
• 0-20 lbs
• < 1200 AGL
• < 100 kts

Army / Navy
/ USMC/
SOCOM
RQ-11
Raven



SOCOM
Puma



Navy / Air
Force /
SOCOM
Wasp





















Army gMAV
Navy T-Hawk

*Small Family
of Systems*

Nano UAS



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



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



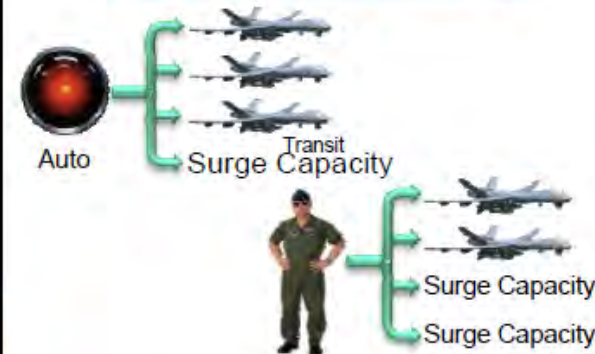
MAC = 1 pilot can fly up to 4 a/c

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

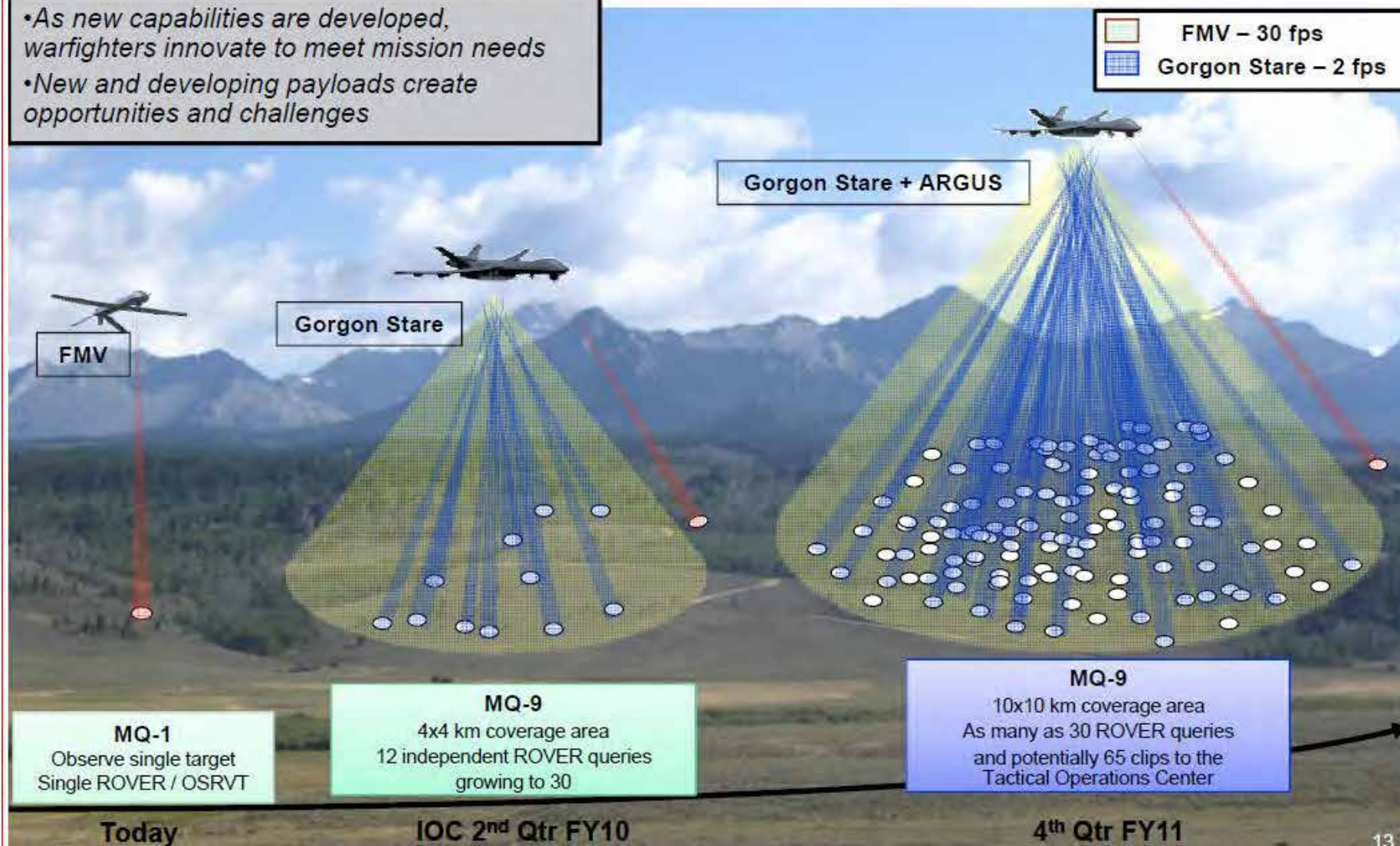




Wide Area Airborne Surveillance (WAAS)

- 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



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



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

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

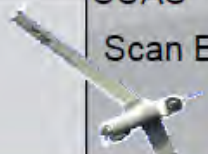
Anti-Access Support

Voyeur SUAS

Technical Demonstration

Multi-Mission

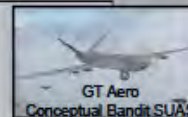
- ISR
- Force protection
- FID



Scan Eagle

Tier II Joint

- ISR
- Comm Relay
- Lethal
- SIGINT



GT Aero Conceptual Bandit SUAS

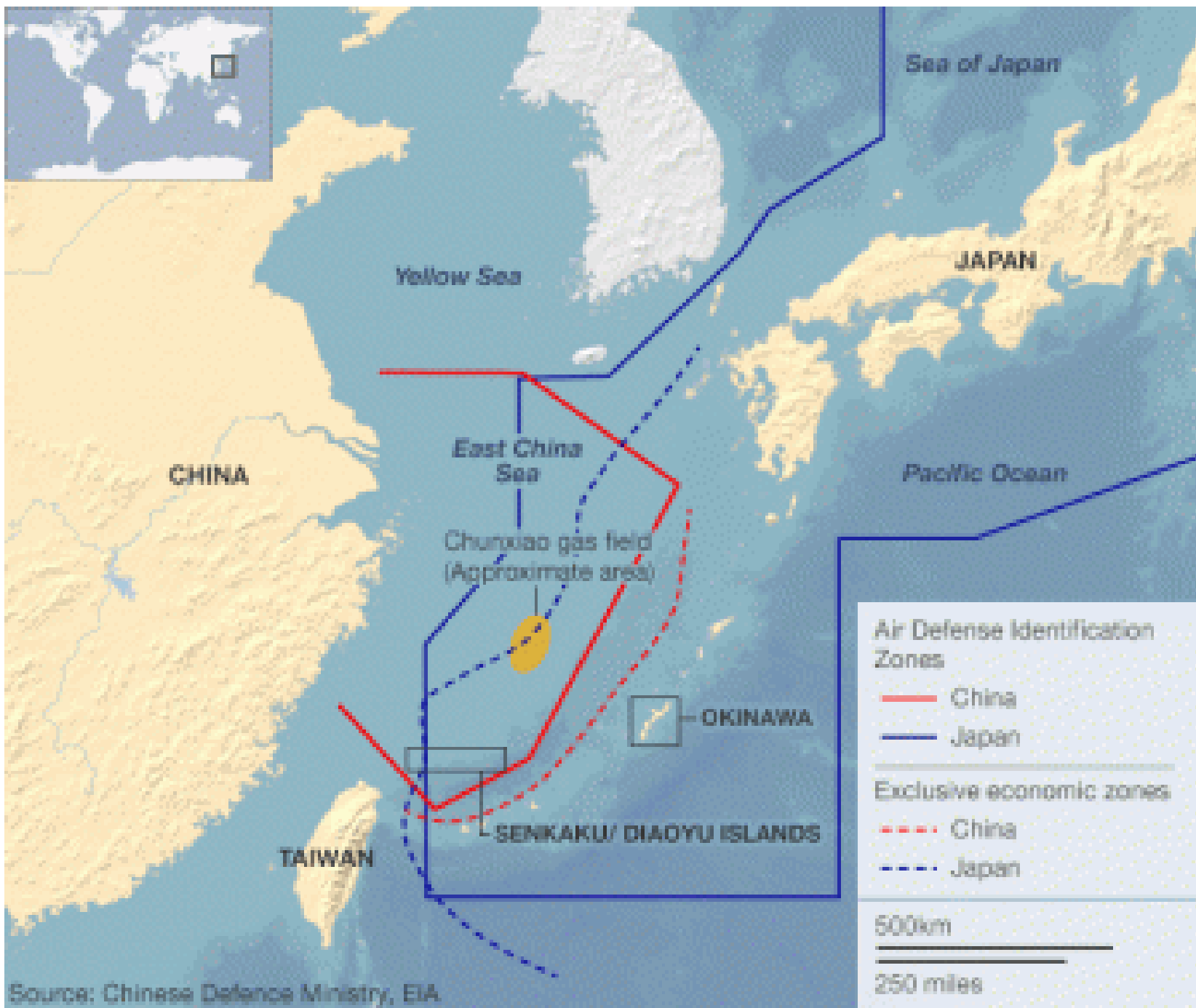
Next Gen Multi-Mission

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

Now

Future





Source: Chinese Defence Ministry, EIA

XFC-UCAS Launched from Sea Robin system

system

2013-11



Level	Name	Description
1	Human Operated	A human operator makes all decisions. The system has no autonomous control of its environment although it may have information-only responses to sensed data.
2	Human Delegated	The vehicle can perform many functions independently of human control when delegated to do so. This level encompasses automatic controls, engine controls, and other low-level automation that must be activated or deactivated by human input and must act in mutual exclusion of human operation.
3	Human Supervised	The system can perform a wide variety of activities when given top-level permissions or direction by a human. Both the human and the system can initiate behaviors based on sensed data, but the system can do so only if within the scope of its currently directed tasks.
4	Fully Autonomous	The system receives goals from humans and translates them into tasks to be performed without human interaction. A human could still enter the loop in an emergency or change the goals, although in practice there may be significant time delays before human intervention occurs.

