



EA-18G Growler Airborne Electronic Attack

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2014 Airpower Seminar

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Scope

- Why?
- What?
- How?
- When?
- Challenges
- Key Messages
- Questions



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Why?

- The Electromagnetic (EM) Spectrum warfighting domain
 - Force dependence creates vulnerabilities
 - A paradigm shift is required - Growler is the forcing function for ADF
- The EM spectrum can no longer be viewed as an enabler, but rather as a primary warfighting domain, on par with land, sea, air and space operations:

*"cyberspace and the EM spectrum now form one continuous environment.... In fact, future conflicts will not be won simply by using the EM spectrum and cyberspace, they will be won **within the EM spectrum and cyberspace**. This will require changes to our operating concepts, military systems and – most importantly – **a new way of thinking**."*

Chief of US Naval Operations - Admiral Greenert 24 Jul 2012

"Breaking down the walls, breaking down the stovepipes of Defence is central if we are actually going to realise the full capability of fifth gen capabilities."

Chief of Air Force – Air Marshal Brown 29 May 2014

- **EM Spectrum superiority is not optional**

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Electronic Attack and the Growler

The Mission

- Deny, Delay, Deceive, Degrade. Targeting the human layer via their equipment
 - Envelope the enemy in the fog of war, sow confusion, provide time and space for one's own forces
 - Jam the adversaries' radars. Disrupt his communications. Support decision superiority

The Aircraft

- The sole dedicated tactical AEA aircraft in the world, *Growler* covers more of the militarily-relevant portion of the EM spectrum than any other tactical asset:
 - kinetic and non-kinetic options, across the range of military operations,
 - On its first overseas deployment, the *Growler* went directly into combat and proved its value in both Iraq and Libya
 - *Growler* is an ongoing US program of record, with Joint support
 - ADF well placed to leverage that success

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Strategic Defence Environment

- Global warfighting philosophies are changing:
 - Threat is lethal, mobile, hidden
 - Increased surveillance
 - Improved ISR and situational awareness
 - LOAC and ROE issues
- Regional powers are evolving:
 - Minimal effect of the GFC
 - Territorial disputes
 - Increasing investment in modern military systems
- Highly dynamic and evolving immediate security environment





The ADF Plan - The Networked Force

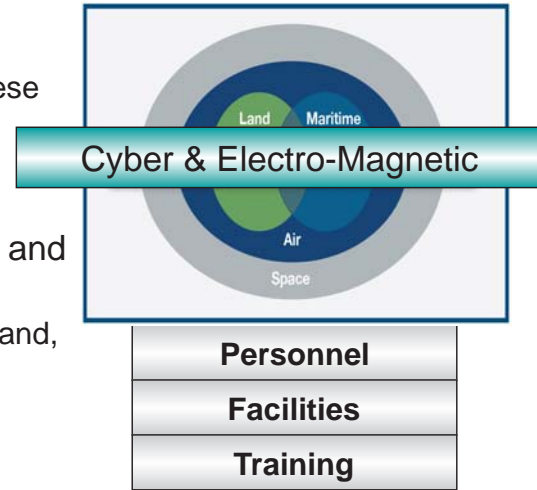
- Technically Advanced, networked systems operated by highly trained personnel:
 - Air Warfare Destroyer
 - AEW&C
 - P-8A
 - MH-60R
 - VIGILAIRE
 - JSOW
 - Super Hornet
 - Growler
 - F-35
 - Special Forces
 - JORN
 - Triton
- Linking sensors, intelligence, command and control and engagement systems
- THE GOAL - Shared situational awareness, synchronised manoeuvre and cooperative engagement



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Warfighting Environment

- Current Environment
 - Contested land, sea, air and space
 - EM and cyber are critical domains that span these environments
 - Contested and Congested
- Additional capabilities in the electro-magnetic and cyber domains
 - required to compliment and enable traditional Land, Sea, Air and Space capabilities



Effects based, scalable force response



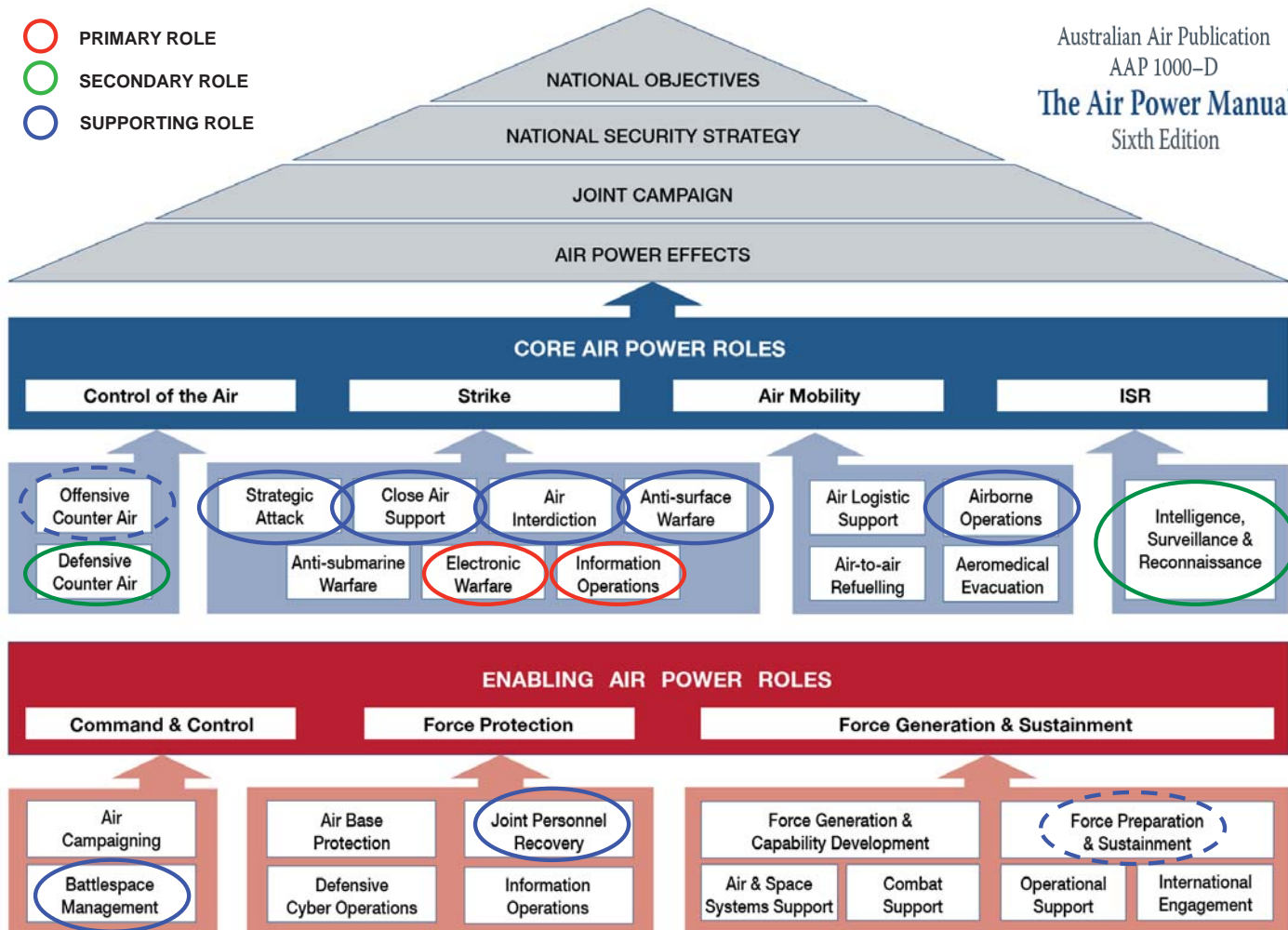
Figure 2-3: Spectrum of Conflict

The Air Power Manual,
RAAF AAP1000, 3rd edition, 1998, p. 15

- Responsive, flexible and scalable engagement options
 - Precise and contained effects
 - Coordinated large scale operations



- PRIMARY ROLE
- SECONDARY ROLE
- SUPPORTING ROLE





What is Growler?





Air Combat Capability as a system

- Air Combat Platforms

- F/A-18A/B+ Hornet
- F/A-18F Super Hornet
- F-35A JSF

- Support Platforms

- Multi-Role Tanker Transport

- Complementary Platforms/Systems

- AEW&C, P-8A,
EA-18G, JORN, Sns
- AEGIS AWD

- Fundamental Capability

- Training



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AIR5349 Phase 3

Introducing EA-18G Airborne Electronic Attack to the ADF

- Government approved in 2012
 - ~~Conversion of 12 F/A-18F+ to EA-18G~~
 - ALQ-99 Tactical Jamming System
 - HARM/AARGM Anti-Radiation Missile training capability
 - Initial aircrew and technician training (2014-2016)
- Subject to Government approval in 2014
 - Facilities
 - Mobile Threat Training Emitter
 - DSTO collaborative EW development
 - Ongoing aircrew training (2016-)
- Future consideration? FSR will inform
 - Next Generation Jammer (NGJ)
 - Other enhancements

May 13 = 12 New Jets (ACCTR)



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Growler vs Super Hornet

Differences:

- Improved computing power
 - Additional highly sensitive antennas
 - Improved cross-cueing of sensors for targeting
 - Electronic attack pods
 - air-to-ground weapons
 - Includes anti-radiation missiles
- **Distinct Growler Tasks:**
 - Electronic Surveillance
 - Counter Communications
 - EM disruption and denial
 - Weapon controller
 - Network Node
 - EW Battle Manager
 - Not a traditional Counter Air or Strike asset

Shared:

- Airframe
- Radar
- Targeting pod
- Networking
- Propulsion
- AIM-120



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EA-18G Electronic Attack Technology

ALQ-218(V)2 RF Receiver System

- Wideband receiver provides accurate emitter identification and location
- Enables reactive jamming capability

ALQ-227(V)1 Communication Countermeasures Set (CCS)

- Smaller and more capable than USQ-113 with expandable infrastructure
- Transmit function through low-band ALQ-99 jammer pod

ALQ-99 Tactical Jamming Pods

- Proven system is already in U.S. Navy inventory
- Ongoing transmitter upgrade program

Interference Cancellation System (INCANS)

- Provides UHF communications capability during ALQ-99 jamming
- Significant communication and situational awareness improvement



Multi-mission Network Node

- JTT-R SATCOM receive capability for off-board sensor information
 - Provides access to Integrated Broadcast Service (IBS)
- Enhanced Link-16 message set when compared to Strike Fighter aircraft

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ALQ-218(v)2 RF receiver system

- Uses a unique combination of short, medium and long baseline interferometer techniques with a patented passive ranging algorithm to provide geolocation of emitters
 - Used to cue ALQ-99 jammers and other onboard sensors such as ATFLIR and radar
- **Multiple items throughout the aircraft:**
 - Wingtip Pods and multiple other Antennae
 - Broad RF Range: Bands 0, 1, 2 and band 3
 - Signal Types: Radar (Pulsed & CW) with optional COMM support
 - High Sensitivity and Dynamic Range
 - Dynamic Tuning in sparse signal environment (Jamming)
 - Passive Precision Geolocation expandable to targeting accuracies
 - Specific Emitter Identification (to USG MISPE standards)
 - Commercial Interference Mitigation (in bands 0 & 1)
 - Enhanced Fine Frequency Measurement supporting Jamming
 - Modern Frequency Domain Digital Channelized Receiver
 - Processor and Power supply in Gun Bay AEA Computer Pallet

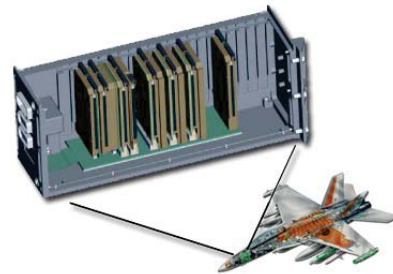


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ALQ-227 Communications Countermeasures Set

- Communication countermeasure set attributes
 - Rapid detection
 - Accurate analysis & classification
 - 360-degree coverage
- Technical architecture provides
 - Flexible response to future threats
 - Broader frequency coverage
 - Higher confidence of acquisition
 - Covers voice and data signals
- Addresses adaptive / asymmetric warfare challenges
 - Provides capability to analyze and jam
 - Distinguishes between signal types
 - Software reprogrammable



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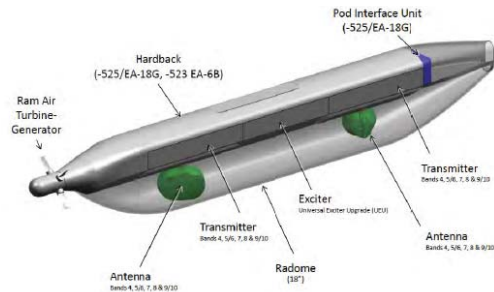
ALQ-99 Tactical Jamming Pods



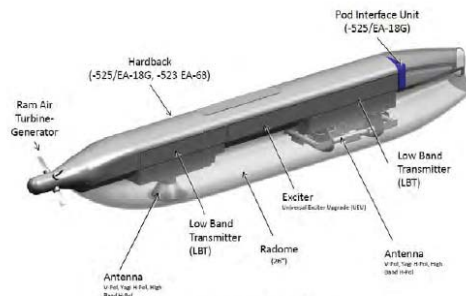
Maximum Load – 5 Pods
Typical Load – 3 Pods
2 Wing Station : High Band
1 Centerline : Low Band

A Pod-Mounted Weapons System

- Offensive Electronic Attack
- 1 -vs- Many EA from Standoff / Modified Escort position
- Synthesize, amplify, radiate & control multiple high power jamming modulations
 - Requires integration with AEA Receiver System
- Modular & Flight-Line Reconfigurable



**ALQ-99 Pod
(High Band)**

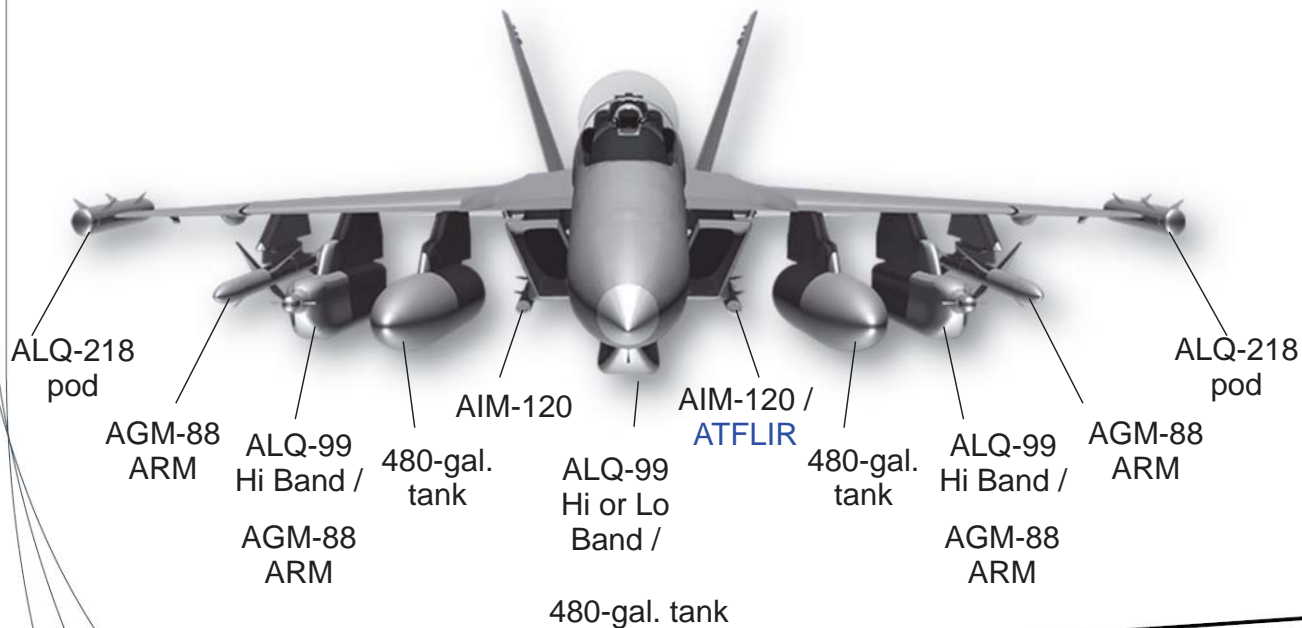


**ALQ-99 Pod
(Low Band)**

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Growler Loadout - Kinetic & Non-Kinetic



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AGM-88 HARM/AARGM

- AGM-88 High-Speed Anti-Radiation Missile (HARM)
- EA-18G can carry up to four, generally two
- AGM-88E AARGM is latest variant
 - Additional MMW seeker
 - DEAD vice SEAD weapon



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Hard kill electronic attack – There can be good reasons to destroy



How?

- Superb Growler Team:
 - USN, OSD, STRATCOM JEWG, US Industry, USAF et al
 - RAAF, CDG, DMO, HQJOC, JCC, DSTO, RAN, Army, HQSO, Aus Industry.
- Excellent progress on Data sharing and RAAF Embeds CONUS
 - Evolution to US based EW Operational Support
 - USN value a new DNA source into the small AEA community
- Transition and acquisition based upon FIC element view
- Detailed operational scenario modelling to drive crewing/sparing etc
- Application of lessons from ASH, USN EA-18G and other ADF transitions
- Significant Facilities design and construction effort underway

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Training

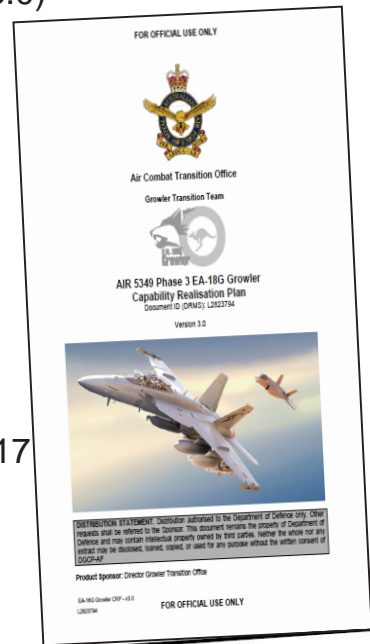
- **AEA training requires an adaptive adversary threat**
 - Radar, Comms and combined scenarios required
 - ES Geo-location and EA serials
- **Unlike a traditional EW Range, the emitters are the Targets**
 - Detect, ID, classify, geo-locate, pass data, prioritise, jam, assess
 - AEA range mutually beneficial for other ADF and Allied users
- **Increased use of distributed simulation desirable, but still need real RF**
 - Emulators not sufficient but can form part of the mix
 - NAS Fallon exemplar
 - Mission Rehearsal becomes more important with Networked Force
- **Large Force Employment exercises require Red IADS and full debrief capability**
 - RED Air integration, NRT Kill Removal, EA & SEAD effectiveness via RTO





When?

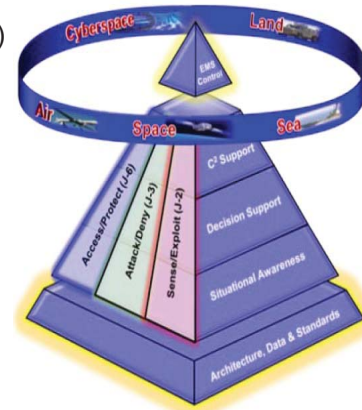
- Driven by GTO Capability Realisation Plan (CRP v3.0)
- Already learning:
 - RAAF aircrew at NAS Whidbey Island
 - RAAF ENG at AEA IPT
 - RAAF Intel Officer
- RAAF LOT 38 Growlers in production now
- USN DT/AT flying commences late 2015
- Technician & Intel cadre training in mid-late 2016
- RAAF In Service Date at NAS Whidbey Island Jan 17
- RTA in two tranches (Mar & Jul 17)
- **IOC - Jul 18**
 - OC 2 - Jul 19
 - OC 3 - Jul 21
- **FOC - Jul 22**



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Challenges

- **AEA Enterprise Analysis**
 - Multiple ADF/ADO Stakeholders:
 - HQ Joint Operations Command (HQJOC)
 - AOC
 - Air Force HQ
 - HQ Air Command
 - Army / Navy / SOCOMD
 - Intelligence & Security Group
 - Defence Spectrum Office (DSO)
 - Defence and Science Technology Organisation (DSTO)
- **Education**
 - Internal and external to Air Force
 - Tactical, Operational & Strategic Levels
- **Alignment of data standards across networked force**
- **Spectrum Management & Licensing**
- **HQ procedures, processes and staff training**



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More Challenges....

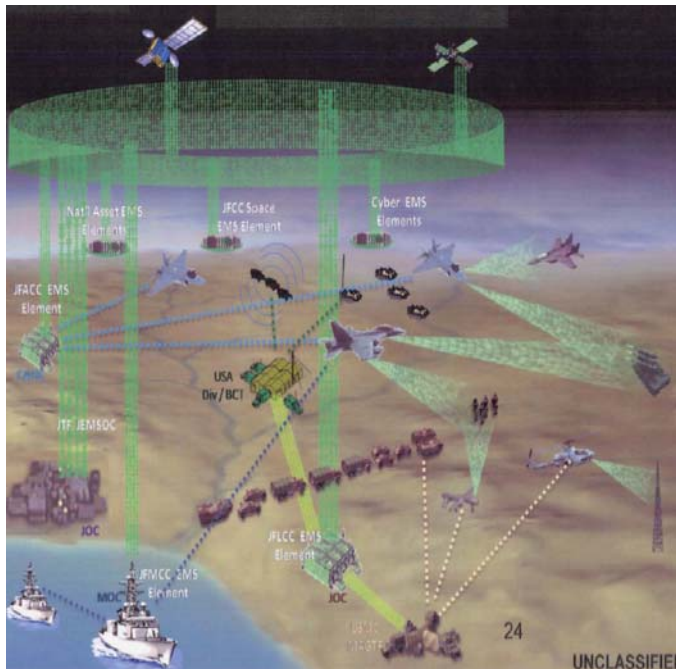
- **Operations**
 - CONOPS
 - TACPROCS
 - Mission data flow
 - Air Campaigning
 - Intelligence support to Non-Kinetic Effects (TSA)
 - Non-Kinetic Effects synchronisation (JPTL)
 - EMS Management Operations (e.g. JRFL)
 - ISR Processing, Exploitation & Dissemination (PED)
 - NKE Battle Damage Assessment (BDA)
- **Operational Support**
 - EW Operational Support (EWOS) Strategy
 - JATO and EWDS support architecture
- **Test and Evaluation**
 - I/OT&E & F/OT&E



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5th Gen Joint Warfighting CONOPS?

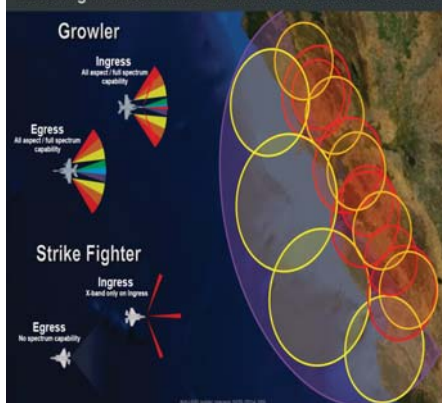


- Must harness the power of the 4 & 4.5 Gen assets, C4I, ISR and ICT systems to truly realise the capability of 5th Gen force
- FLEW as an enduring embedded element, not a bolt on
- Growler continues to support Land, Maritime & Air Protected Entities (PEs)



The Future? Here's one version

2028 High Threat A2AD Environment Demands Growler



The Advanced Growler



- A personal view:
 - Growler must evolve to remain ahead of the emerging threat
 - NGJ and ALQ-218, 227 & Avionics upgrades important
 - Ongoing consideration of weapon options

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Key Takeaways

- Significant ADF Integration yet to do (FLEW is a new Pillar for the ADF):
 - Some [paradigms will need to change](#)
 - Perfect timing to drive [Fifth Generation System](#) mindset across ADF
 - All AFHQ Transition Offices [cross project boundaries](#) to ensure force multiplication
 - Major acquisition in train, now we must [induct new capabilities](#) and [exploit their potential](#)
- Superb support from USN and wider US AEA Community
 - [One Growler Team](#) – From the Military, Scientific and Industry perspectives
- Growler is a [penetrating](#) AEA FLEW [service provider](#)
 - A [fat jet in a thin jet's body](#)
 - A low density, high demand asset requiring [Effects Based](#) tasking
 - Has [utility across the spectrum of conflict](#)
 - Large [focus on Joint Force](#) support
- [Adapting](#) via Spiral Upgrades to maintain pace [ahead of evolving threat](#)



QUESTIONS ?

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