THE AIR UNIVERSITY

BLUE HORIZONS 2012

Striking Globally: Knowledge, Reach, and Power in the Age of Surprise

UNITED STATES AIR FORCE
CENTER FOR STRATEGY AND TECHNOLOGY
Meta-Strategy for the Age of Surprise

at The Air University

UNCLASSIFIED

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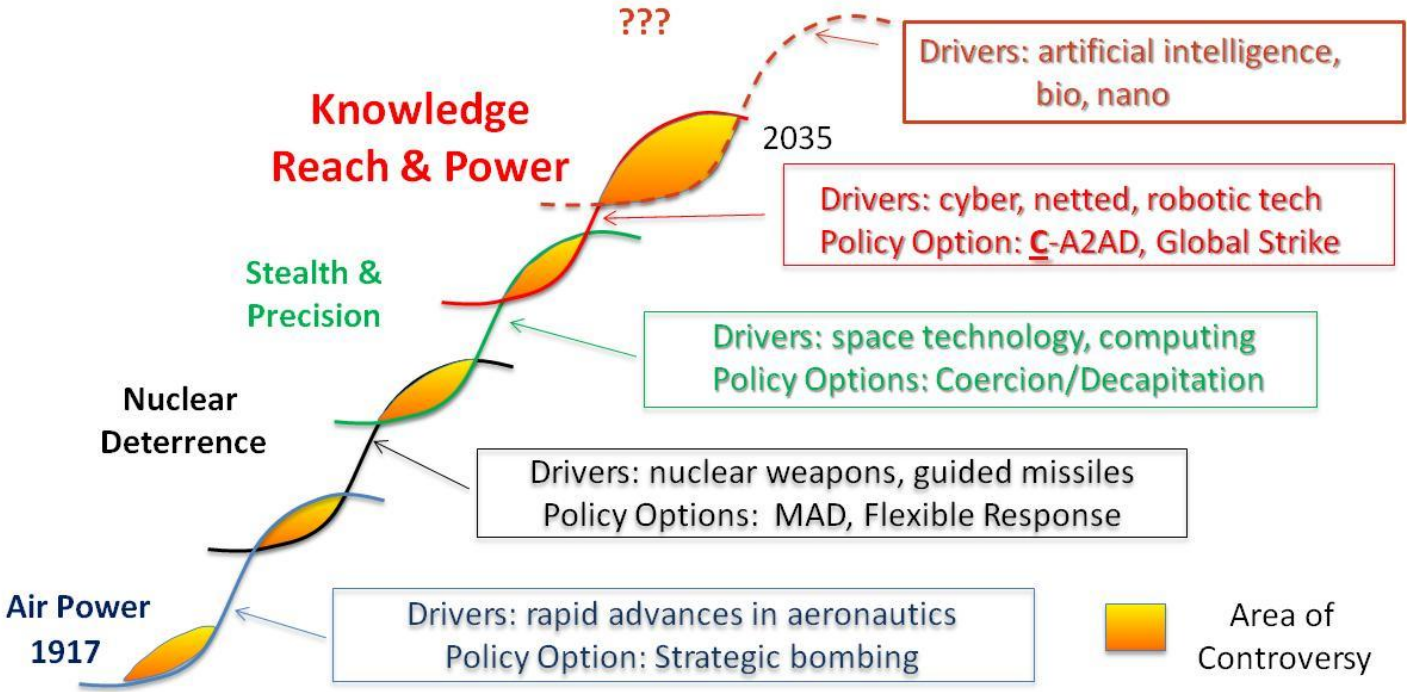
SUBJECT: Blue Horizons 2012: Striking Globally, Knowledge, Reach, and Power in the Age of Surprise (Slide Presentation)

USAF Tradition - Transforming to Meet Future Challenges



Our tradition is to re-invent ourselves to provide meaningful policy options for the President

USAF is at a new inflection point, beyond stealth and precision

- **Generation of <u>Knowledge</u> becomes an Air Force core function**
  - Ability to sense improves, but threats multiply in type, number & severity
  - Finding is as important to deterrence as fighting in a chaotic world
- **Air Force thinking on <u>Reach</u> evolves**
  - Reach = maintain sensor and weapons density at range over time
  - Connectivity eclipses platforms in thinking; enables new CONOPS
- **<u>Power</u> comes from new effects; nuclear weapons remain essential**
  - Volumetric weapons return; weapons survivability becomes a concern
  - Defense is back; uncontested dominance ends; continuous competition

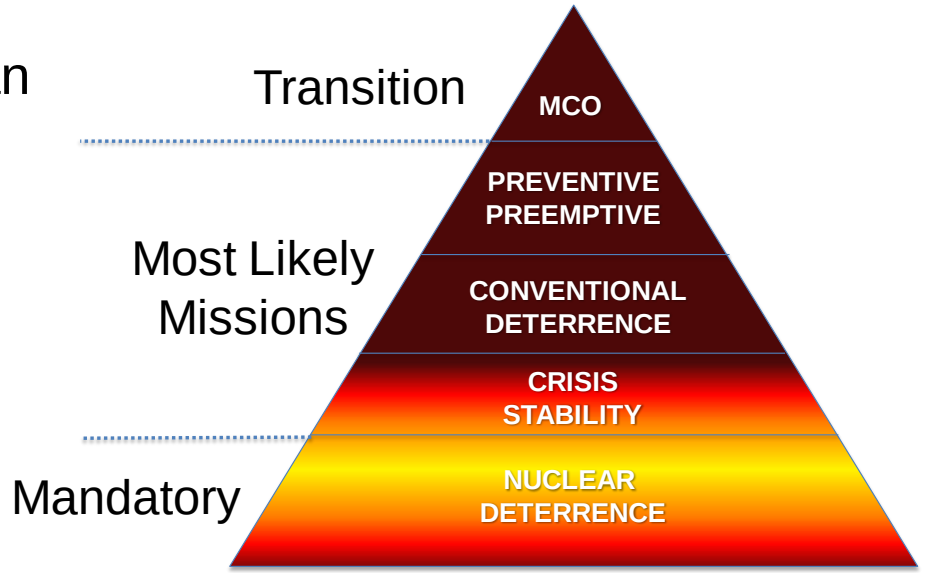
DATA uncorrelated facts → **INFORMATION** correlated data → **AWARENESS** fused information with context → **KNOWLEDGE** actionable, attributable awareness

Operational Assumptions for Our Study

1. Precise positioning and timing are available without GPS
2. USAF purchases next-generation bomber (Top 3 AF priority in ‘12)
3. Kinetic global strike from space is not viable
4. Group/individual problem set is a lesser included case of the nation-state problem set
5. Line of sight communications can be degraded, but rarely wholly denied; impacts operations intermittently, backups required
6. US stealth advantage contested: stealth/counter stealth competition
7. In anti-access, missiles will always get through on both sides
8. The homeland is in range in an expanding number of scenarios
9. Expect operational surprises—no US corner on innovation

Global Strike Today

- A strategic attack directed by the NCA designed to deny or punish an adversary
- A tiered mission for nuclear, conventional, & virtual deterrence
- Used against states or ***groups/individuals***
- Involves entire targeting process
- Requires elements of all 12 Air Force core functions to execute



Global Strike defines for Airmen what we are about in simple terms

Breaking News About 2035

Technologies are:

- **leveling the playing field**
- **merging with synergistic impacts**

- **Geostrategic & technological competition return**
- **Absent ISR/PED, deterrence fails**
- **Counter-sensor battle results**

- **Internet of Things: 7 trillion devices by 2025—2035?**

TMS-320

PL-12/SD-10

AIM-120

R-77/AA-12

"Google Maps" + Ubiquitous Precision

Breaking News About 2035

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- Internet of Things: 7 trillion devices by 2025—2035?

Globalization dramatically reduced the multi-year, Cold-War-era US technology lead

A more "leveled," multi-player competition will be different:

- ISR/PED foundational to deterrence
- Speed-to-field is the next big race
- Innovation trumps doctrine and tradition
- Flexible architectures trump enterprises
- Build to either a throw-away standard or continuous upgrade standard

Breaking News About 2035

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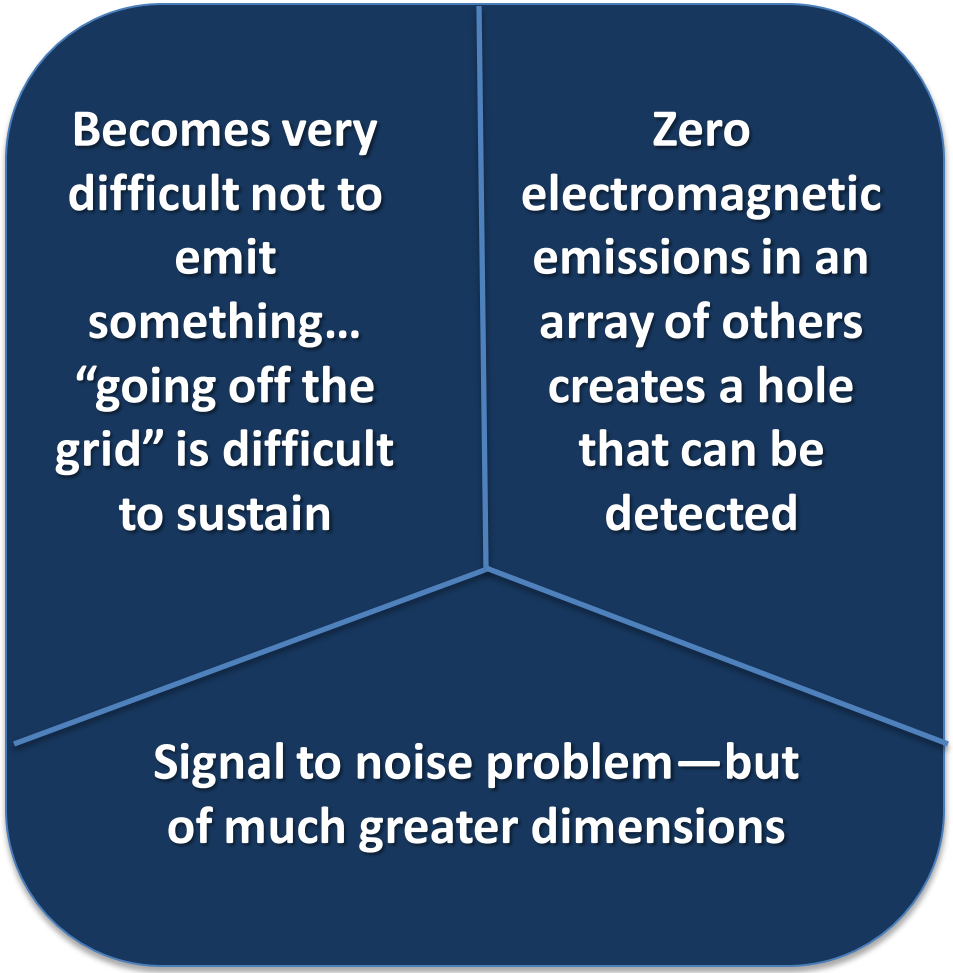
- **Internet of Things: 31 billion devices by 2025—2035?**

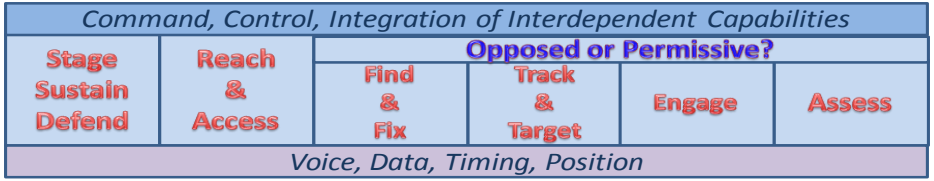


Three Schools on Global Strike

Prompt Strike	Standoff	Penetrating
• CONUS-based ICBMs, hypersonics & cyber • Cheaper than defending forward • Simpler: No A/R, military or diplomatic access • Fixed target base; less capability vs. mobile or deeply buried; magazine limited	• Air-breathing cruise or hypersonic missiles, cyber • Saturate air defenses; cheaper than buying long-range strike • Less capability vs. mobile or deeply buried; what happens when all missiles expended?	• Stealth, standoff-support, hypersonics, cyber • Better persistence with greater risk • Reinforces extended deterrence; enables flexible deterrent options • Can strike full range of targets

These schools are differentiated by their approach to time, distance, target, platform, payload, purpose to deter or prevail

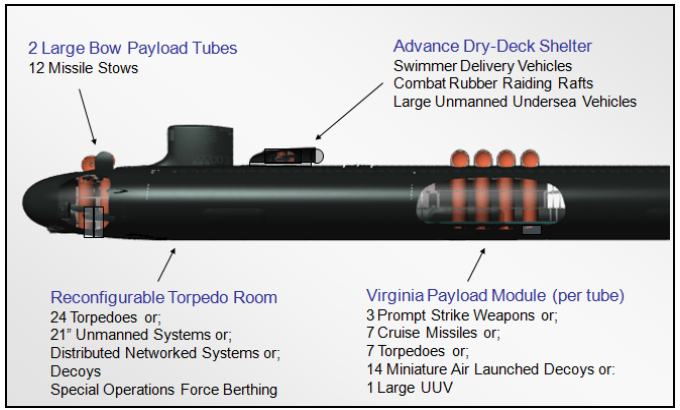
…But the Debate Transitions



2012	Emphasis Shifts	2035
Engage	→	Find and Fix
Platforms	→	Gateway Architectures
Dogfighting	→	Datafighting
Platform Maneuverability	→	Missile Maneuverability
Stealth	→	Hypersonic/Swarm
Precision	→	Volumetric
High Explosive	→	Photonic, Electronic
Destroy	→	The Five Ds
OODA Loop	→	OODA Point
One Big Base	→	Dispersed Operations

Constants: Global Strike Benefits from Joint Participation

- **Virginia SSNs equipped with Virginia Payload Module connected to airborne networks could:**
  - Strike with missiles or deploy air decoys
  - Launch UAVs (comm, ISR, strike)
  - Employ A/A missiles jointly with aircraft
- **Towed Payload Module adds extra capacity**
- **SOF**
  - Act as a sensor; method to gain electronic access
  - Deploy tags, unattended sensors, pocket JTACs



Health and marriage of stealths increasingly important to AirSea Battle

Constants: Nuclear Weapons Remain Essential for US Deterrence

- **USAF should resist further reductions in nuclear weapons**
  - Conventional deterrence may not be possible
- **Options:**
  1. **US needs a "universal kill switch" short of nuclear exchange**
     - A standing EMP capability is a must (others will have)
  2. **Next USAF ICBM should be mobile**
     - Improves US A2AD capabilities/signaling capability
     - Hedges against undersea detection
  3. **A2AD threat requires a new, long-range cruise missile capability**

US needs at least one of these capabilities to maintain nuclear deterrence capability and credibility

Posturing the USAF for Global Strike

Concepts

- **Cross-service & domain intelligence and weapons integration**
- **Logistics systems that support dispersed operations**
- **Command for machine-based, decision-making environments**

Execution

- **Hallmark of success: fusing and using time-sensitive knowledge**
- **Always executing; datafighting & planning are continuous**
- **Increase emphasis on range in force mix**

Posturing the USAF for Global Strike

Investments (1)

- Develop, deploy, & maintain connected gateway architectures
- Cyber = knowledge generation, offense, defense
- Artificial intelligence, virtual assistants and intelligence augmentation to increase decision quality and speed
- PED: agile, resilient, self-forming, self-healing

Posturing the USAF for Global Strike

Investments (2)

- Expand range & payload portfolio; use existing assets creatively
- Pursue low-cost production for quick-to-field, expendable systems
- Force enhancement to win stealth competition: swarms, offensive cyber, DE
- Develop a global training range to exercise Global Strike at scale
- Invest in dual-use airfield infrastructure to enable dispersion

Back-up Slides

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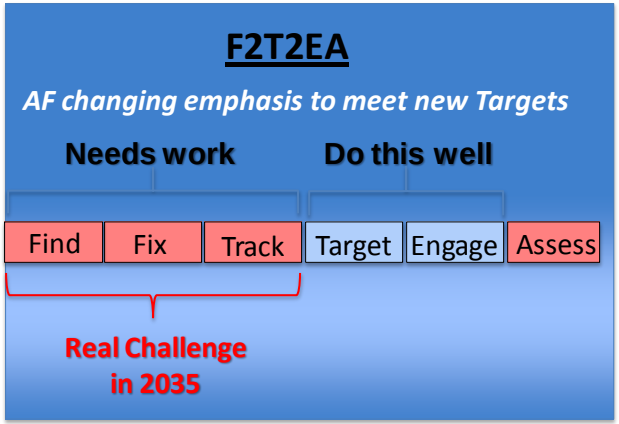
From Engage to Finding and Fixing



- **Targets either dynamic or hardened; multiplying; attribution difficult**
- **Must find method to do ISR/PED at machine speeds direct to user**
- **Major game changers:**
  - Networked, distributed, full-spectrum arrays linked to weapons
  - Integrating cyber as a major finding space; crawl & fuse with ISR information
  - Small and covert sensors: unattended ground sensors, tags and pocket JTAC

Demonstrating you can find becomes as important to deterrence as showing you will strike

From Platforms to Gateway Architectures

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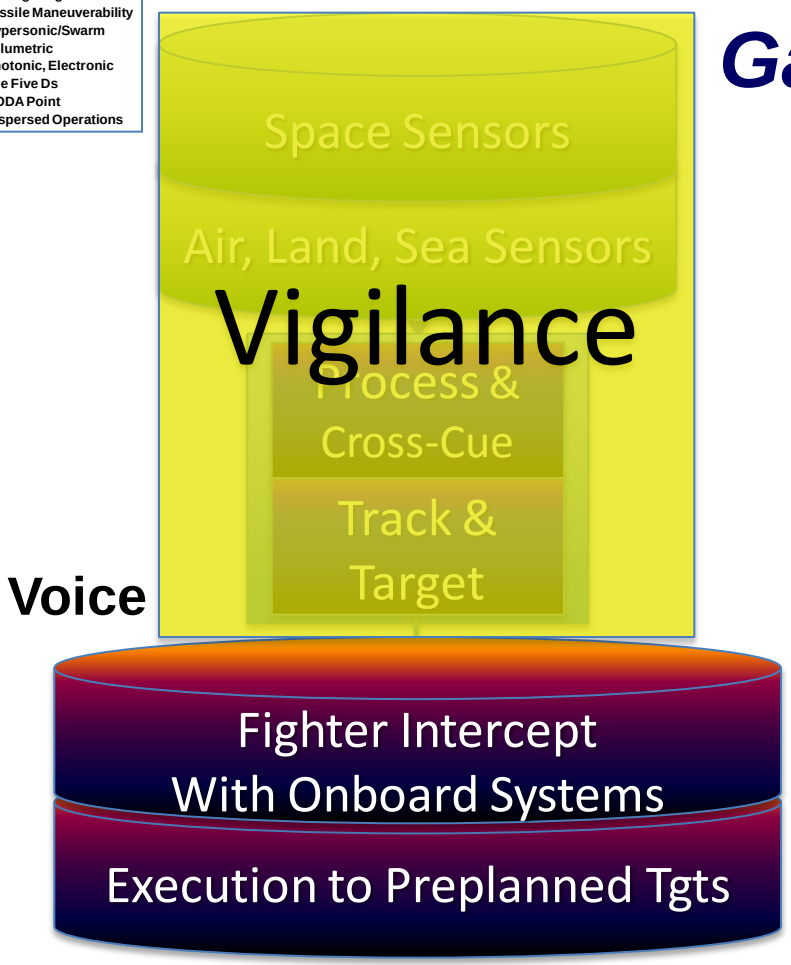
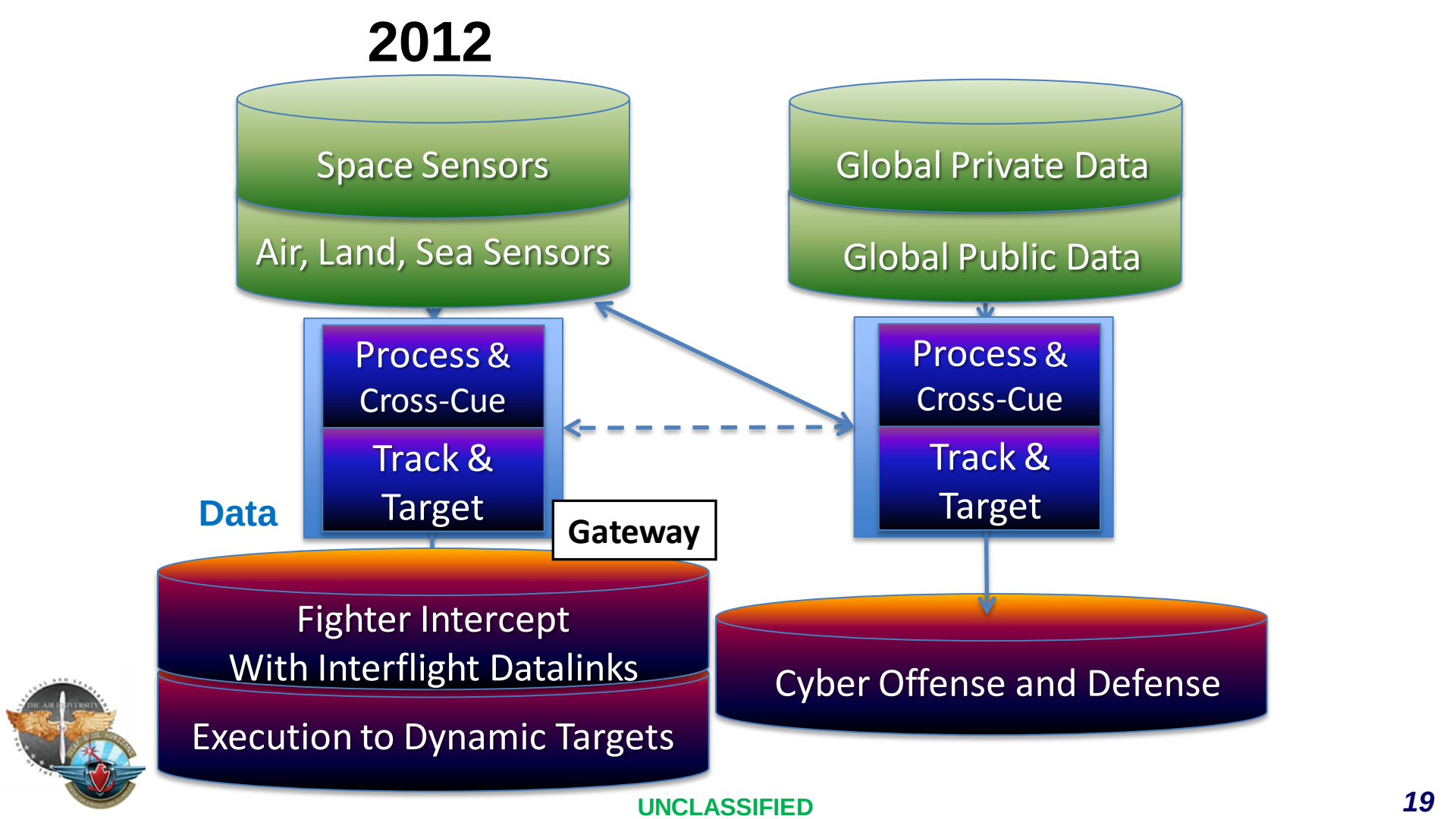
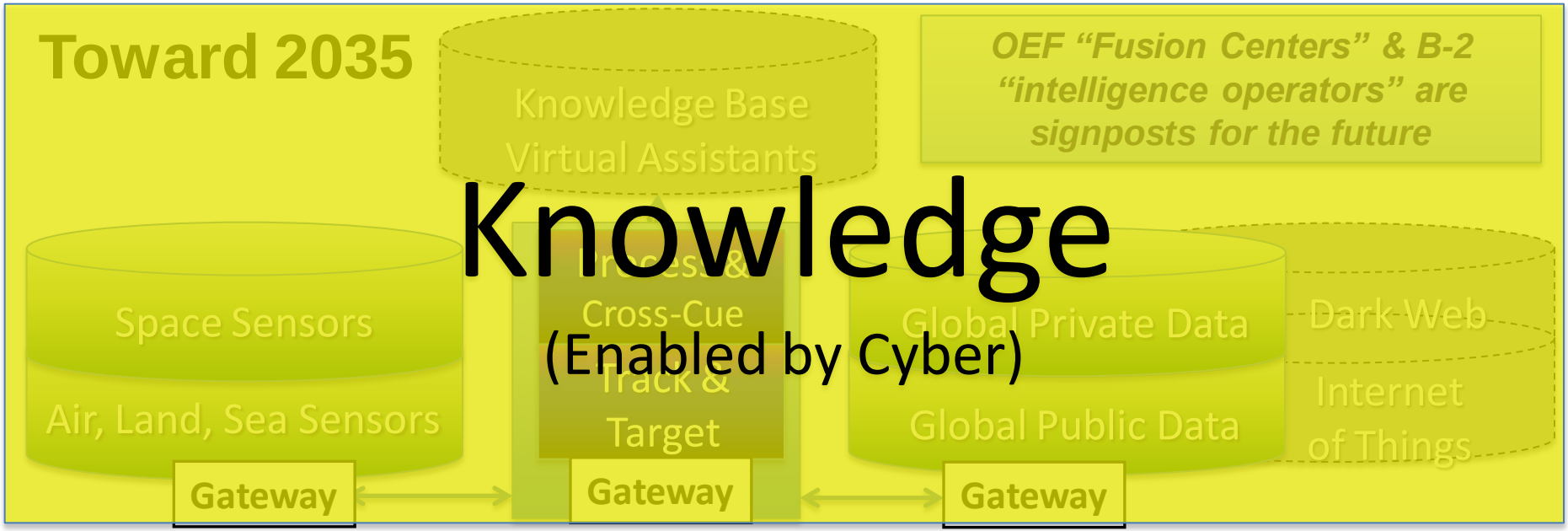



2012
Space Sensors
Air, Land, Sea Sensors
Global Private Data
Global Public Data
Process & Cross-Cue
Track & Target
Process & Cross-Cue
Track & Target
Data
Gateway
Fighter Intercept With Interflight Datalinks
Execution to Dynamic Targets
Cyber Offense and Defense



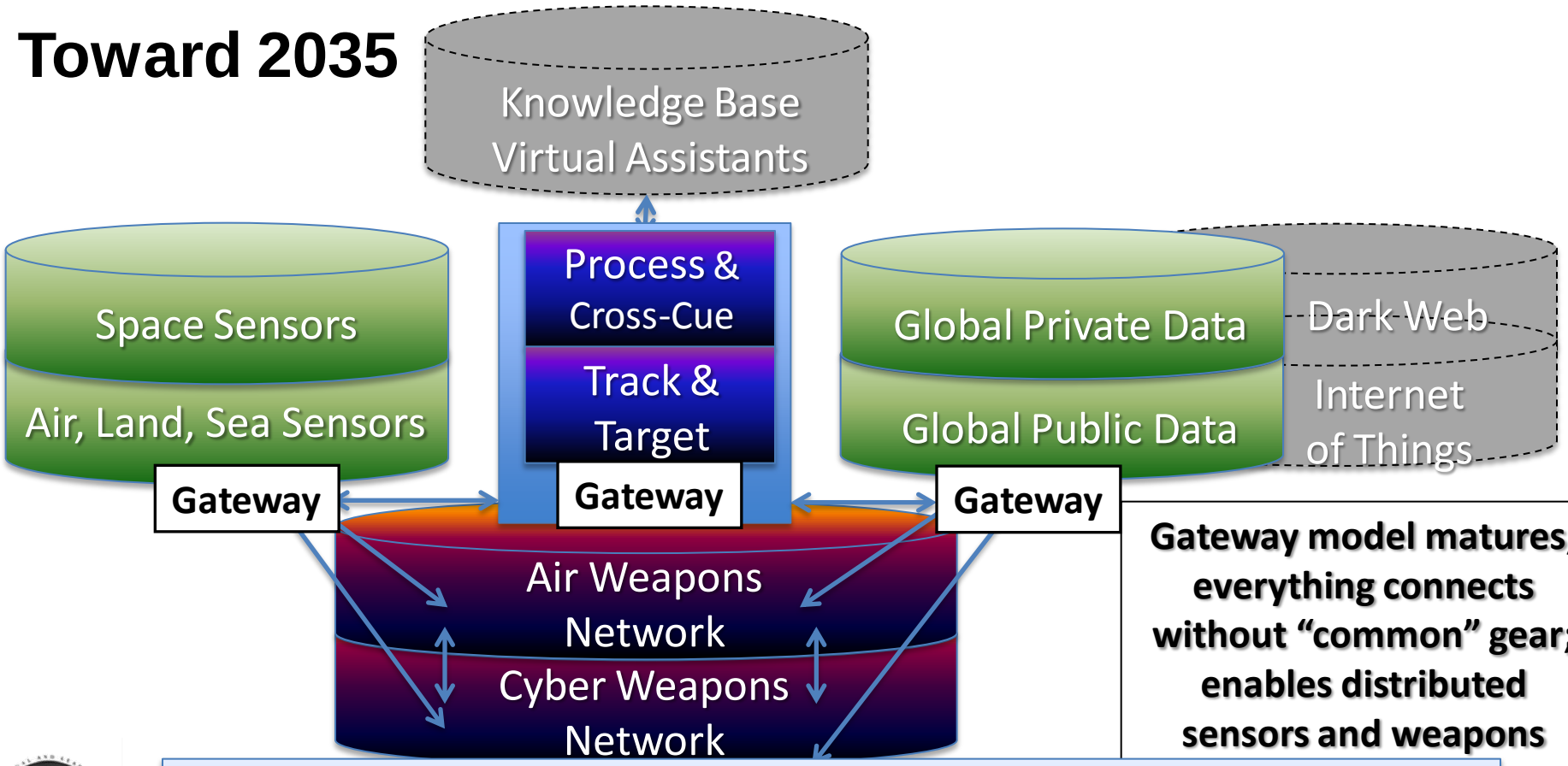
Two kinds of targets in 2035: hardened or dynamic
"Find" task difficult for both; datafighting determines success

Knowledge for USAF Operations

Knowledge is	Knowledge <u>is not</u>
– A better understanding of real-time events – Able to deal with data that is false or contradictory – A more rapid assessment of the strategic environment – Globally connected, cross-cued, all domain, always on	– All the relevant data – 100% accurate – Perfect understanding

"The ability to learn faster than your competition may be the only sustainable competitive advantage."
Ari de Geus, Director for Strategic Planning, Shell Oil

Toward 2035



Gateway model matures; everything connects without "common" gear; enables distributed sensors and weapons

Connecting distributed sensors and weapons enables new CONOPS, strategy and tactics

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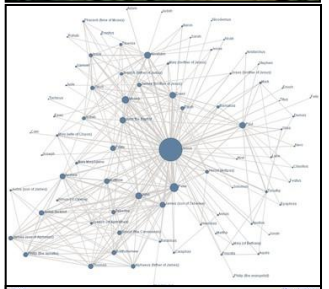
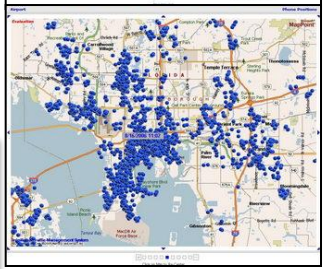
From Dogfighting to Datafighting





- **Disruptive opportunity for USAF**
  - Generating transparency through all-source data fusion
  - Major future weapons system, the CAOC of 2035
  - Holistic distribution: need to share vs. need to know, “data TPFDD” = data priority and paths
  - Resilient: a variety of connection paths, alternative networks
- **But others will have this tech too**
  - Impacts planning/stealth/defense

Whole of government challenge: technology moving much faster than strategy, policy & legal thinking

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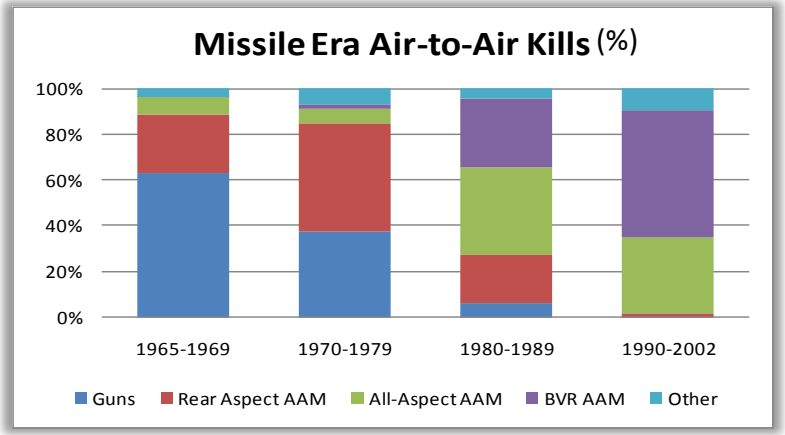
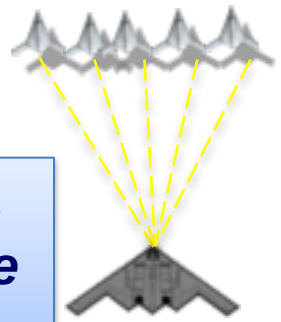
From Platform to Missile Maneuverability

- Missiles getting smarter, more deadly
- Missile and the radar/sensor no longer required to be co-located
- Sensors/seekers become all band
- Can launch larger missiles from larger platforms, dramatically increasing engagement range





Counter-Air Pickets with Sensors

Larger Platform

As sensor and weapon capability increase, platform performance less important—huge implications for CONOPs & force structure

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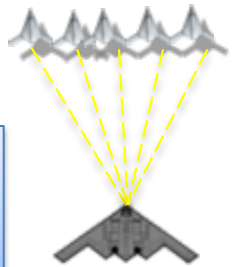
From Stealth to Hypersonic and Swarm

- **Degree of stealth advantage may vary**
- **But penetrating strike still needed to hold hard and deeply buried targets at risk**
- **Needed: hypersonic, swarm, decoy & deception**
  - Hypersonics provide survivable access & timely strike
  - Swarm overwhelms IADS, creates large apertures & multi-axis, multi-domain attacks
  - Countermeasures, decoy, deception: cyber or EW



Stealth is still essential, but its employment will increasingly depend on the generation of chaos

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From Precision to Volumetric

- **Precision: a focus of airpower since 1930s**
- **…but future targets may be either too small, mobile, fleeting, or distributed to find & destroy precisely**
- **…in an economic way**
- **Cyber & RF-directed energy weapons = return to volumetric attacks**
  - Area attacks against electronics: only sure way to achieve objectives?
  - Chem, Bio, Nano, RF, Cyber targets demand 3D, wide area effects

Precision may be defined more by effect & less by CEP with a wholly different understanding of collateral damage

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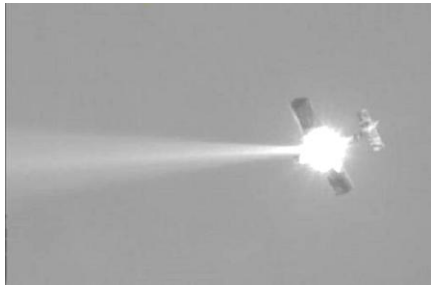
From High Explosive to Photonic and Electronic

- **Explosives become more powerful in this period…**
- **But photonic and electronic weapons come of age**
  - Near term challenge: Synchronizing with kinetic attacks; understanding capabilities & limitations
- **Far term challenge: how to defend…**
  - Sensors and eyeballs increasingly at risk
  - Target platforms *AND* weapons inflight using hit-to-kill missiles or directed energy



Expect a counter sensor battle; expect higher expenditure rates for weapons

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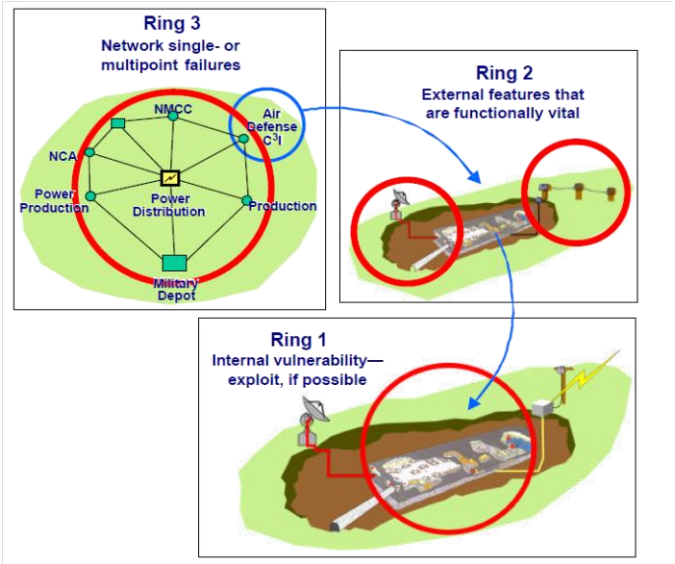
From Destroy to The Five Ds

- **Time and timing much more important**
  - Denial may provide same strategic impact as control
  - Disruption may achieve same effects as destruction
- **Some targets cannot be destroyed**
  - HDBT may require third-way attacks
- **Impact of these attacks may be difficult to assess—no image confirmation**



Burmeister, Regan E. Defense Threat Reduction Agency Briefing. *DTRA Hard & Deeply Buried Target Defeat Test Program*. Underground Facility Schoolhouse: August 19, 2011, slide 175

Tasks to degrade, disrupt, deny, delay, deceive become more common than tasks to destroy

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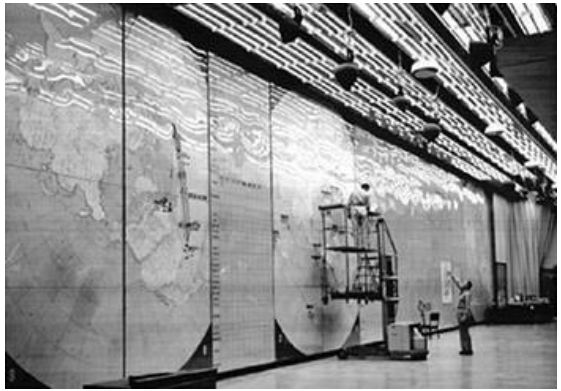
From OODA Loop to OODA Point



- **Global Strike C2 not designed for this future**
- **Time is shrinking, more important**
  - All domain hider/finder competition
  - Decisions: machine speed, faster human, pre-delegation
  - What is command in a world run by algorithms?
- **Current debate on automated decision making will set a trajectory**
  - What reliability standard is required for machine-made decisions?
  - What is the difference between man-made and machine-made mistakes?

Culture may drive the US in one direction; other nations may choose different directions, creating an asymmetry

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From One Big Base to Dispersed Operations

- **Tankers become more essential as find task becomes more difficult**
- **Stacking aircraft at forward bases may not be tenable as threat expands**
- **Options: defend, disperse, distance**
  - Defend: Active defense cost imposing on US
  - Dispersal: Ramp space and logistics the issue
  - Distance: Requires large ramps to concentrate tankers & strike platforms

Moving tankers and strike platforms back requires more ramp space to support more aircraft to fly longer missions

In the Beginning…

SAC Mission Statement, 1946: "The Strategic Air Command will be prepared ***to conduct long-range offensive operations in any part of the world***, either independently or in co-operation with land and naval forces; ***to conduct maximum-range reconnaissance over land or sea…;*** to provide combat units capable of intense and ***sustained combat operations employing the latest and most advanced weapons;*** to train units and personnel of the maintenance of the Strategic Forces in all parts of the world; to perform such ***special missions*** as the Commanding General Army Air forces may direct."

Gen Tooey Spaatz, March 1946

This briefing is the 6th in a series of CSAF directed studies exploring the strategic environment for the Air Force in 2035…

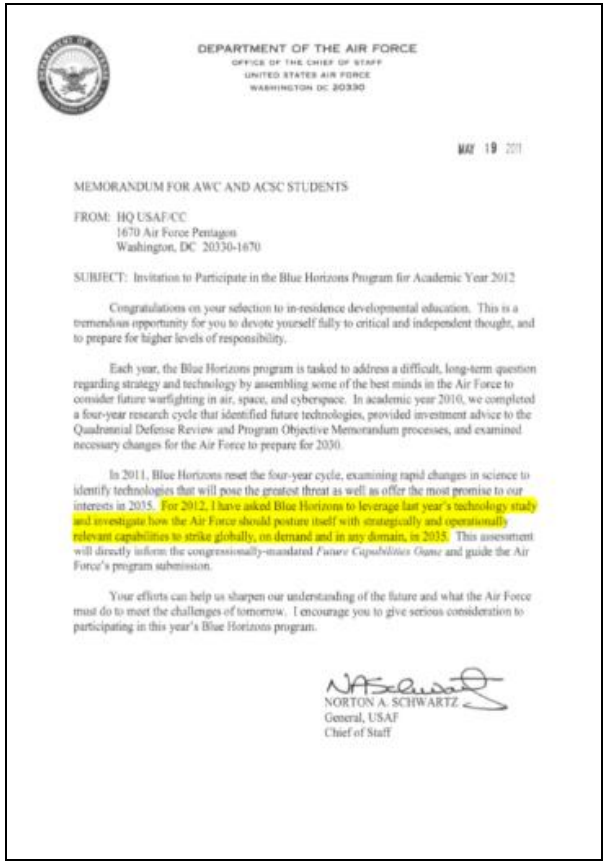
…it is not a set of predictions nor a description of the future…

…it is a collection of fiscally unconstrained insights about what a variety of futures may produce technologically and strategically…

…and a set of ideas to refine the direction the AF to be most relevant and valuable to the nation

It is a briefing more about ideas than things – the risk we face in the future demands that we think differently

CSAF Study Direction for Blue Horizons, Academic Year 2012



DEPARTMENT OF THE AIR FORCE
OFFICE OF THE CHIEF OF STAFF
UNITED STATES AIR FORCE
WASHINGTON DC 20330

MAY 19 201

MEMORANDUM FOR AWC AND ACSC STUDENTS

FROM: HQ USAF/CC
1670 Air Force Pentagon
Washington, DC 20330-1670

SUBJECT: Invitation to Participate in the Blue Horizons Program for Academic Year 2012

Congratulations on your selection to in-residence developmental education. This is a tremendous opportunity for you to devote yourself fully to critical and independent thought, and to prepare for higher levels of responsibility.

Each year, the Blue Horizons program is tasked to address a difficult, long-term question regarding strategy and technology by assembling some of the best minds in the Air Force to consider future warfighting in air, space, and cyberspace. In academic year 2010, we completed a four-year research cycle that identified future technologies, provided investment advice to the Quadrennial Defense Review and Program Objective Memorandum processes, and examined necessary changes for the Air Force to prepare for 2030.

In 2011, Blue Horizons reset the four-year cycle, examining rapid changes in science to identify technologies that will pose the greatest threat as well as offer the most promise to our interests in 2035. For 2012, I have asked Blue Horizons to leverage last year's technology study and investigate how the Air Force should posture itself with strategically and operationally relevant capabilities to strike globally, on demand and in any domain, in 2035. This assessment will directly inform the congressionally-mandated *Future Capabilities Game* and guide the Air Force's program submission.

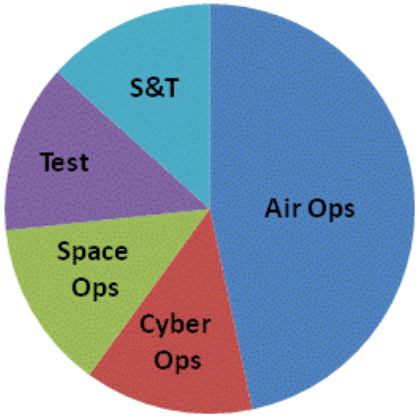
Your efforts can help us sharpen our understanding of the future and what the Air Force must do to meet the challenges of tomorrow. I encourage you to give serious consideration to participating in this year's Blue Horizons program.

NORTON A. SCHWARTZ
General, USAF
Chief of Staff

"…leverage last year's technology study and investigate how the Air Force should posture itself with strategic and operationally relevant capabilities to strike globally, on demand and in any domain, in 2035."

Blue Horizons Researchers

Class Composition

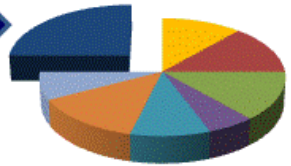


Fellows represent top 12% peer group
Faculty selected 15 from 240 students

Academic Program

AWC Curriculum

Blue Horizons



~302 Hrs

- Classroom 60 Hrs
- Volunteer Elective 24 Hrs
- Research Paper 136 Hrs
- Group TDYs ~70 Hrs
  - Sandia Nat'l Lab
  - Los Alamos Nat'l Lab
  - NASIC
  - AFRL Tech Directorates
- Individual research TDYs ~12 Hrs

A Blue Suit study researching Blue Suit challenges

We Affirm and Clarify

- The essential attribute of Airpower is power projection
- "**Global Strike**" is a unique form of power projection
  - Requires sensor and weapons density at range over time
  - Essential for nuclear, conventional, and virtual deterrence
  - Includes elements of all Core Functions
  - Objective: finding and striking targets, whether physical or virtual, anywhere, any time, as soon as feasible
- Global Strike defines for Airmen what we are about in simple terms

After 20 years of tactical warfare, it is time to reinvigorate Airmen and Airpower thinking

Geostrategic Landscape Shifting; Deterrence Becomes More Complex

State Competition

- Competition intensifies in Pacific Rim, Indian Ocean, Arctic
- Mideast: resources and political instability
- Africa: resources, ungoverned spaces, expanding conflict
- South America: Brazil rises; potential foreign power proxies

Military Realities

- Growing Anti-Access/Area-Denial
- Precision proliferates; threatens bases and power projection
- Datafighting in cyber intensifies
- Nuclear proliferation continues
- Bio most threatening, cost-effective weapon

…And growing threats from non-state actors worldwide

Key Task: Credibly demonstrate the ability to maintain sensor and weapons density at range over time…strategically and operationally relevant capabilities flow from this task

Overlapping Hyper Spectral Sensing in Air, Space, Cyber

Robust PED & Targeting Process and C2

Resilient Connectivity

Integrated Cyber/EW/Kinetic Effects

Space Survivability & Backups

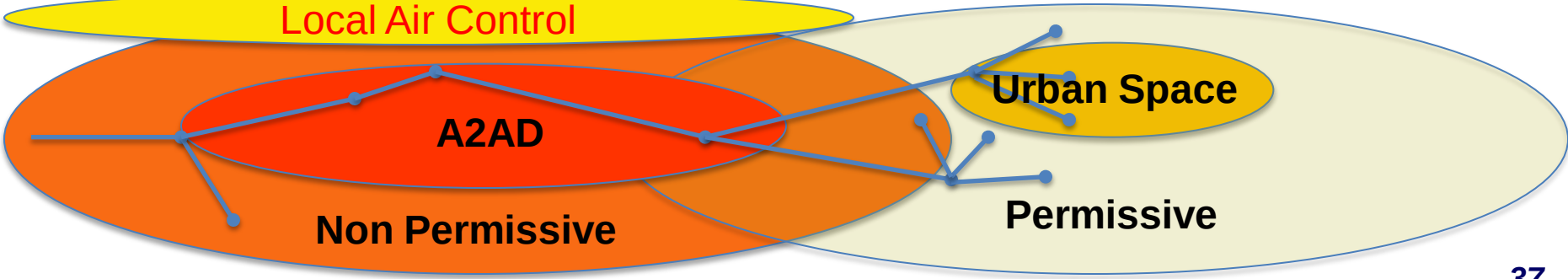
Platform Survivability vs IADS

Weapons Survivability vs IADS

Local Air Control

Ground Sensors/Tags

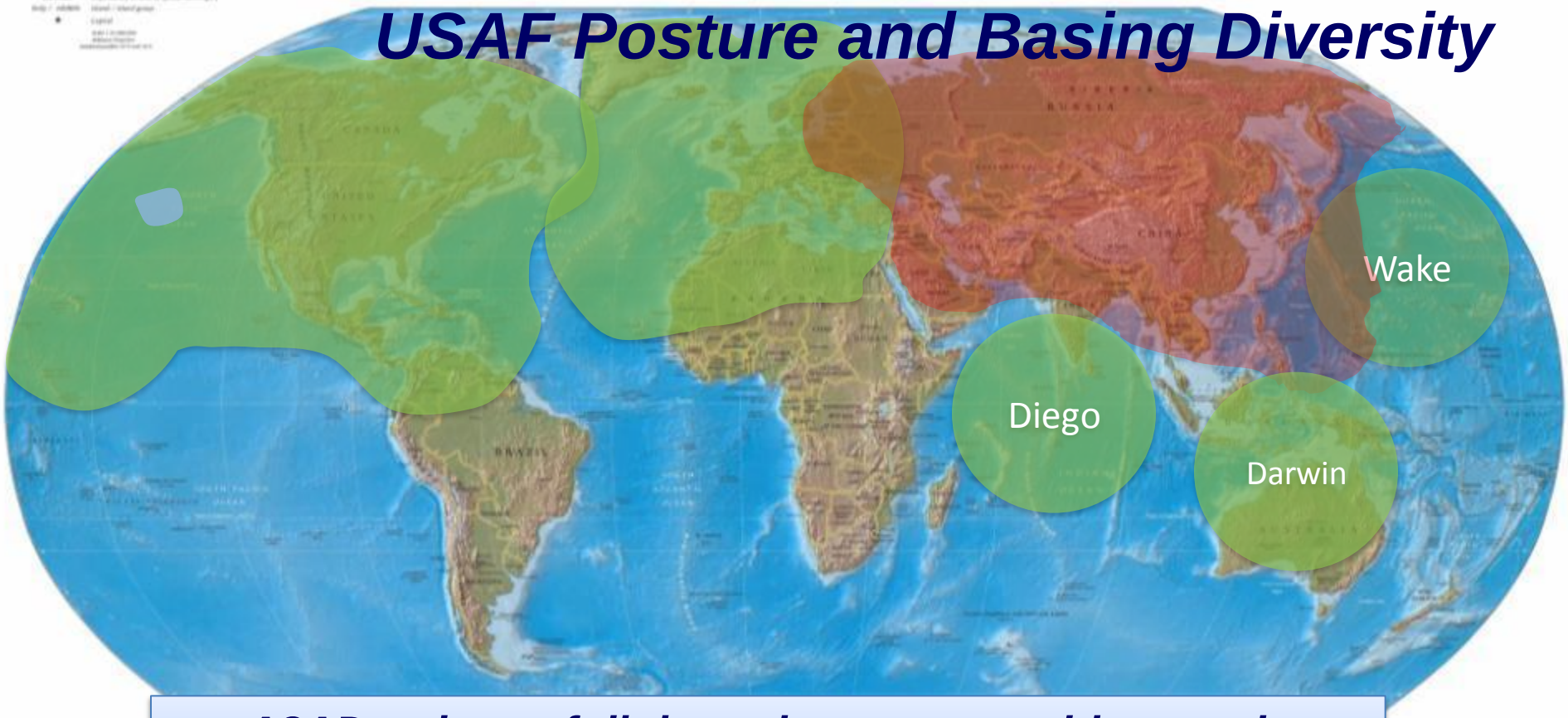
SOF Integration



Shifting First Question for Policymakers: Where Are The Tankers?

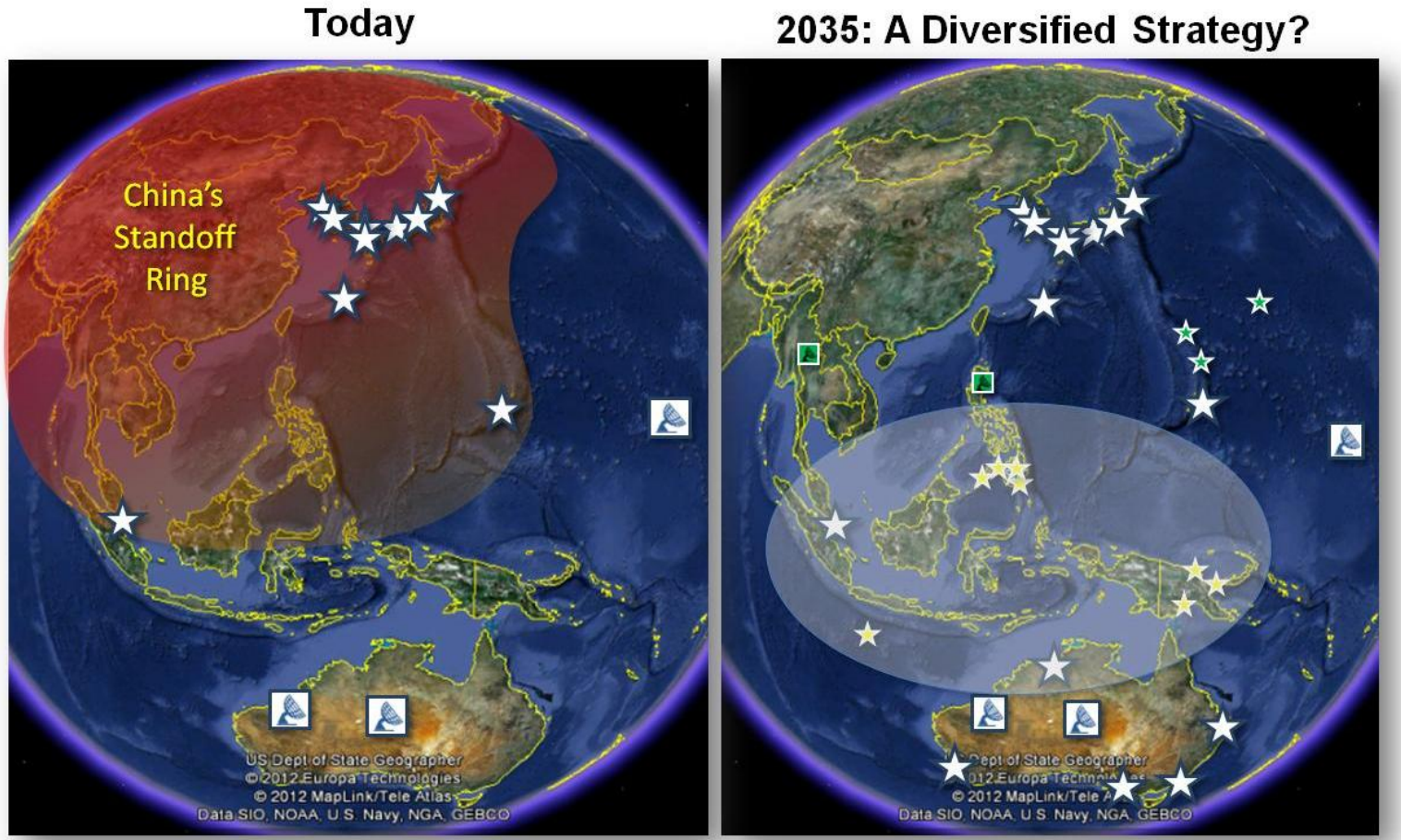
- Tanker bases tend to be forward
- Tend to stack operational bases during crisis
- Current assumption: USAF can rapidly set tankers in place

USAF Posture and Basing Diversity

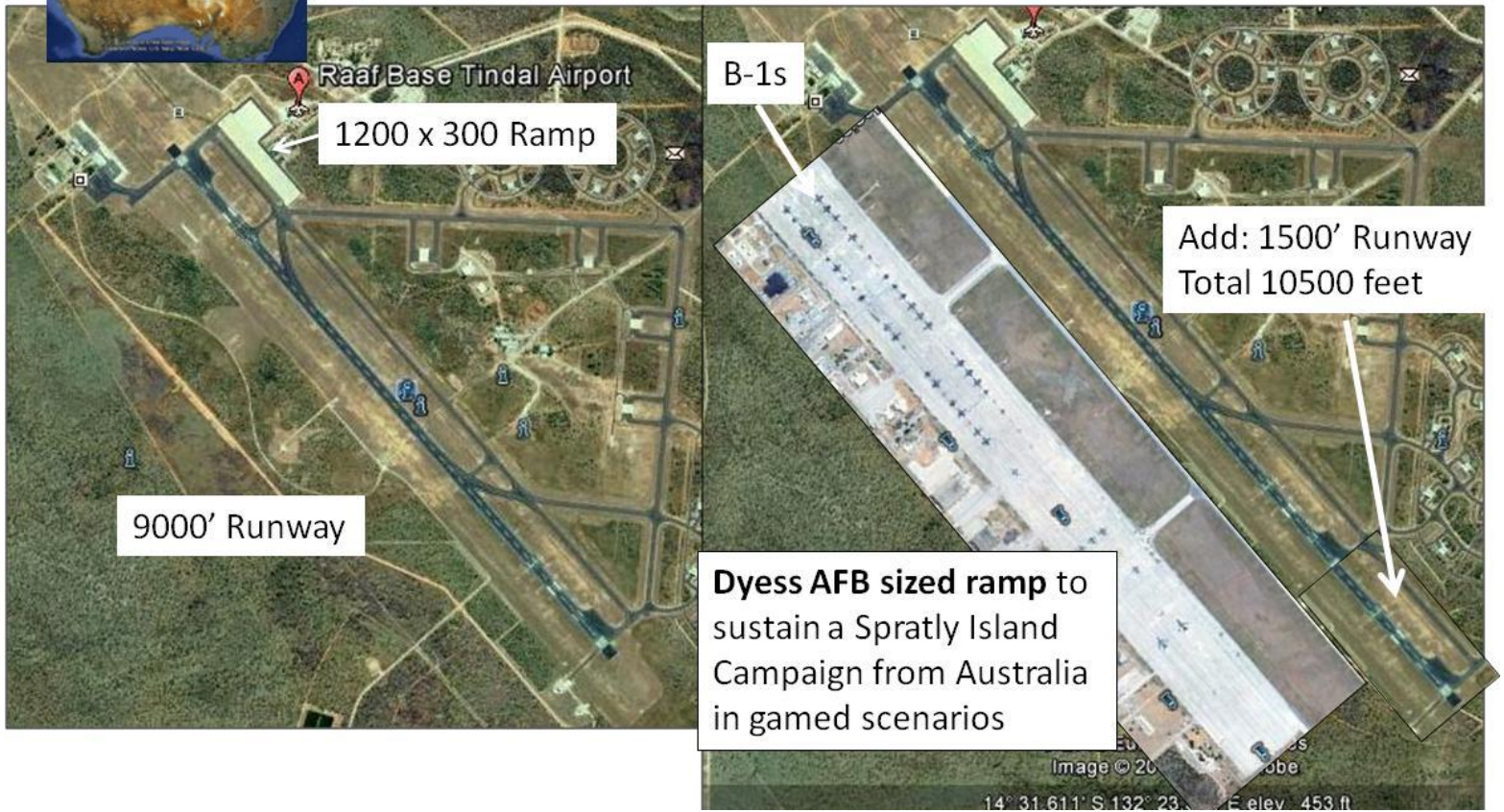


A2AD or loss of diplomatic access could severely limit US operations in most the unstable regions

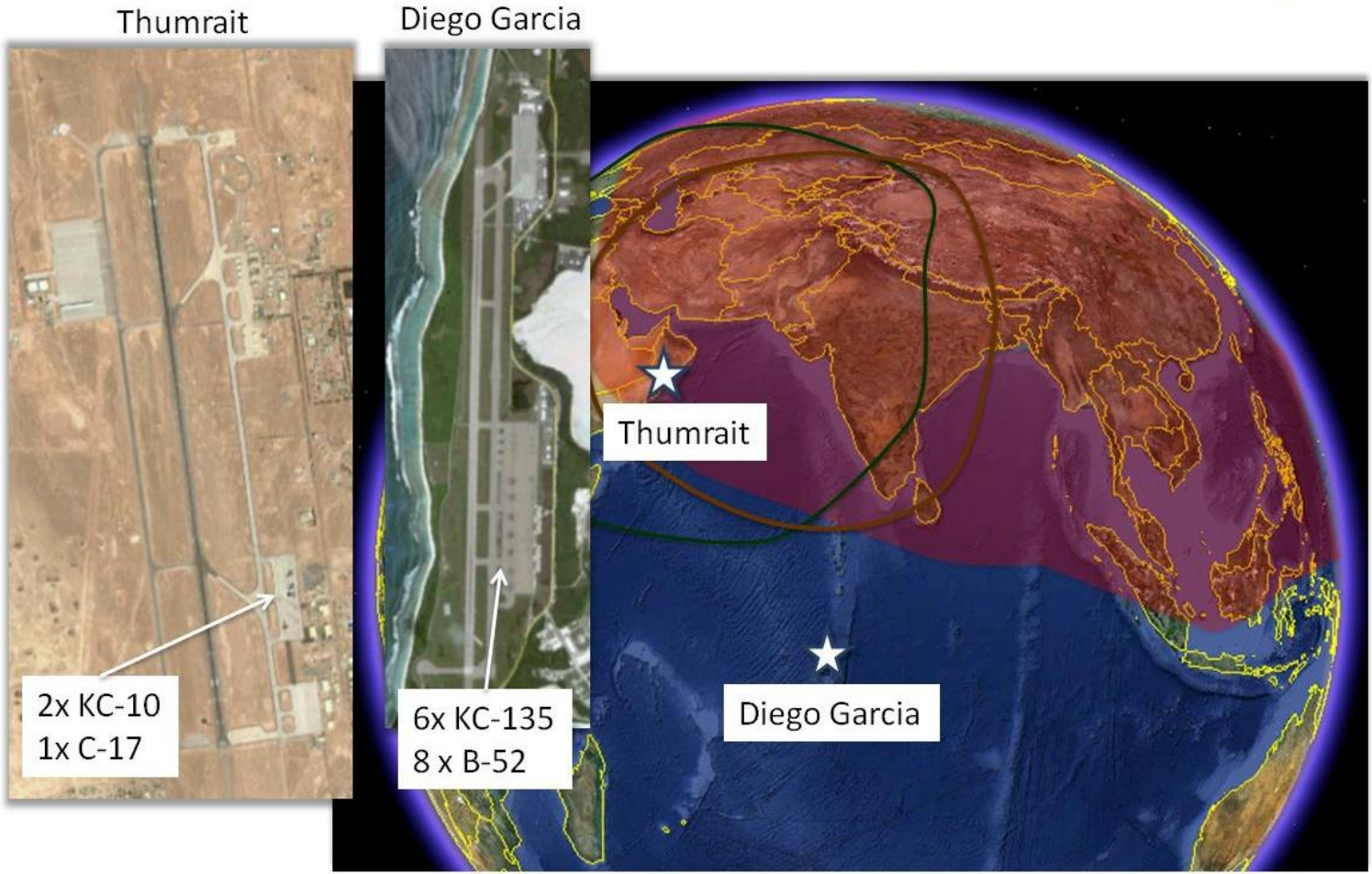
SE and NE Asia Operating Locations



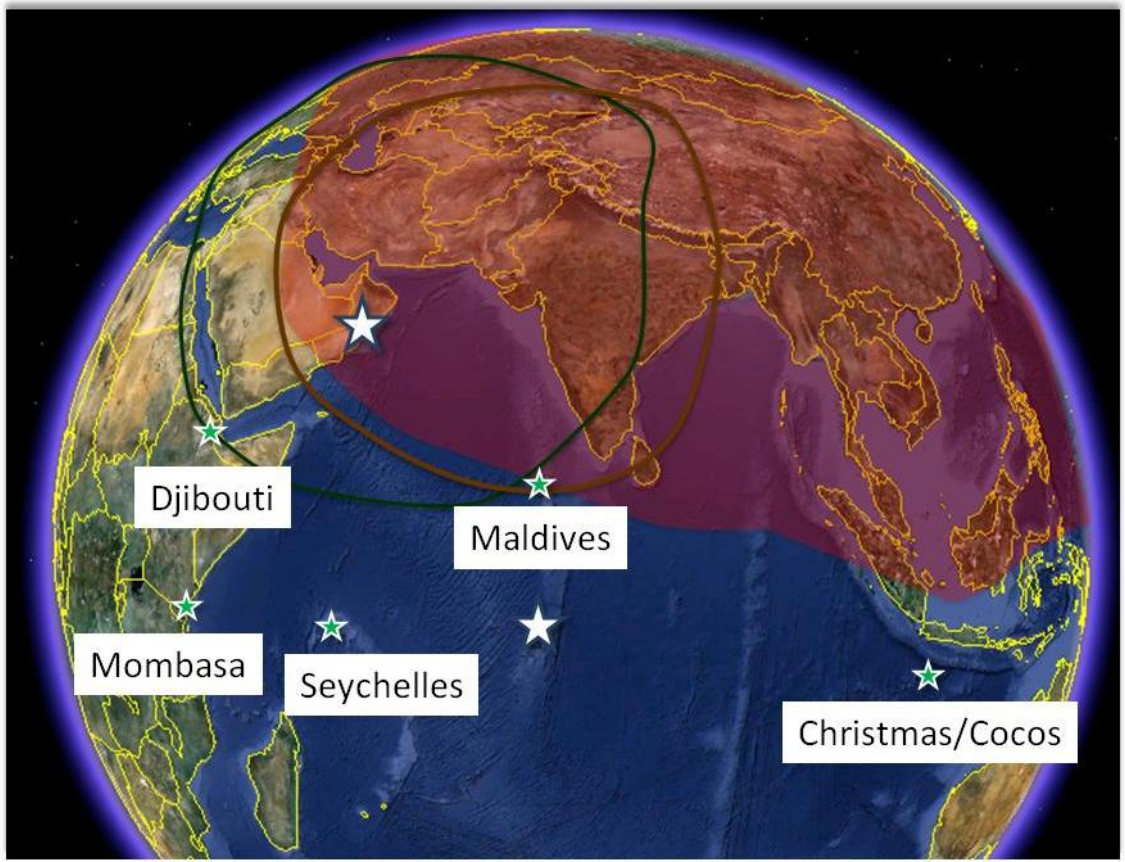
South China Sea Ramp
RAAF Tindal Today



Indian Ocean Tanker Basing



Indian Ocean Tanker Basing



Indian Ocean Ramp?

Mombassa

Djibouti

Seychelles

Maldives

Christmas/Cucos

Undeveloped

USAF should advocate for whole of government approaches to increase ramp space/develop runways at strategically important airfields


C-17s Deliver
Counter Air Pickets
W/passive IRSTS
B-2 Loaded
With 32x
Pac-2
Strike B-2
Comm Gateway
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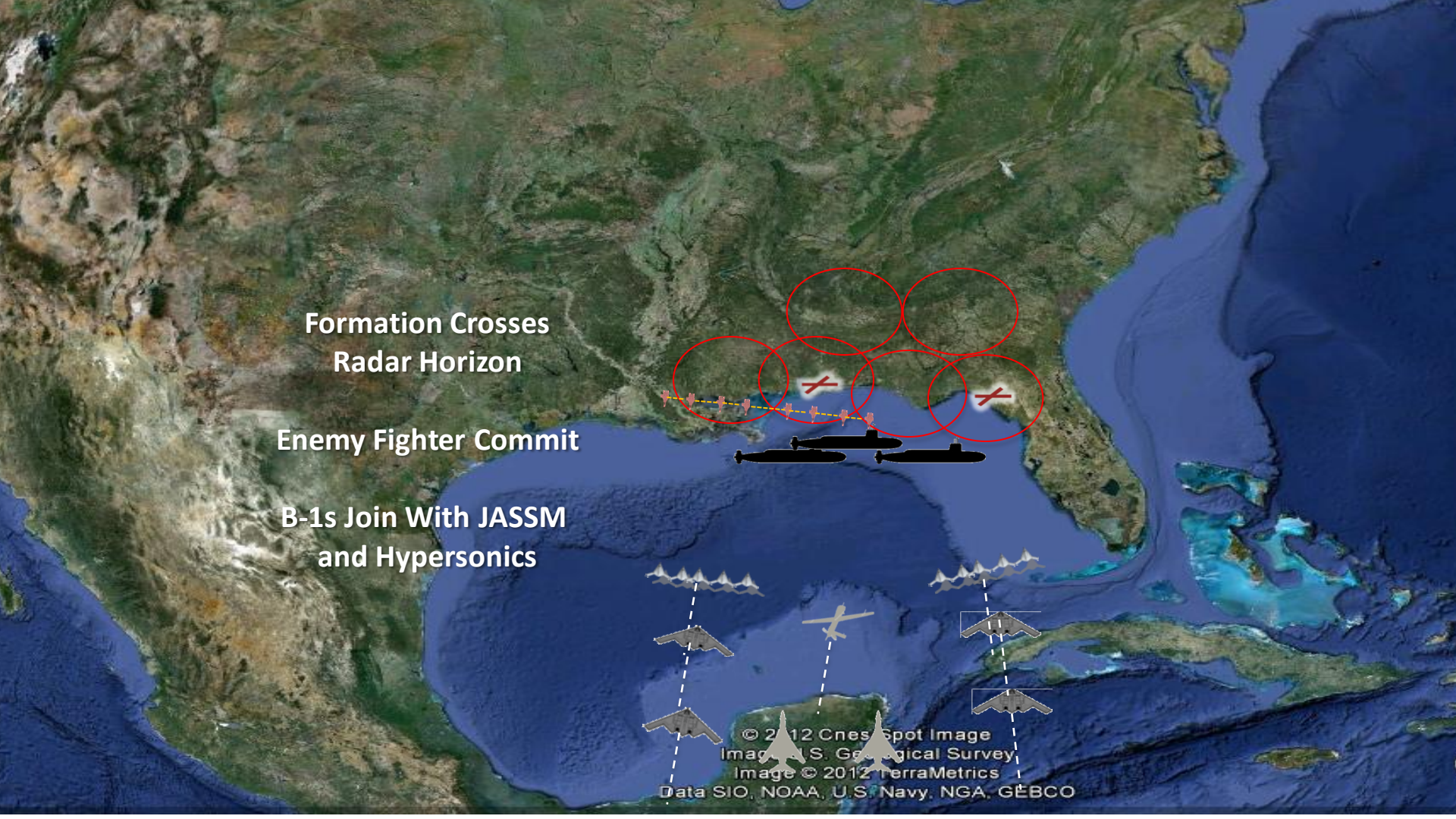
Formation Crosses
Radar Horizon
Enemy Fighter Commit
B-1s Join With JASSM
and Hypersonics
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Submarines Launch Decoys,
Loitering gateway UAV,
ISR missiles to locate SAMs
Enemy Fighters Detected
ISR Pickets
Gateways link B-1s/B-1 and
sub weapons deconflicted
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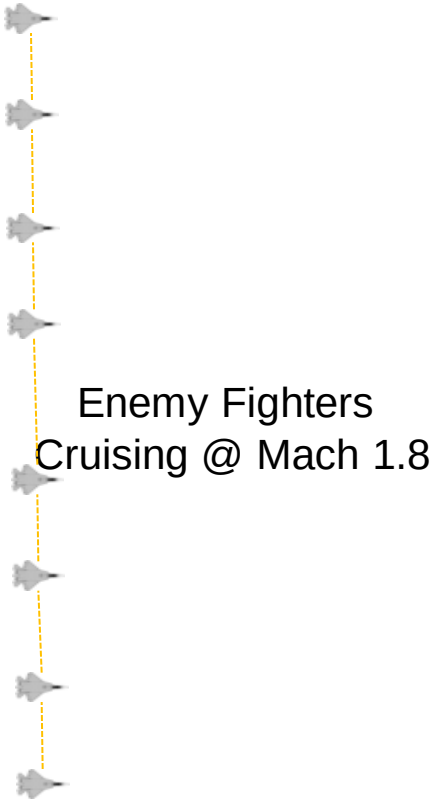
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Potential Concept of Operations



Enemy Fighters
Cruising @ Mach 1.8

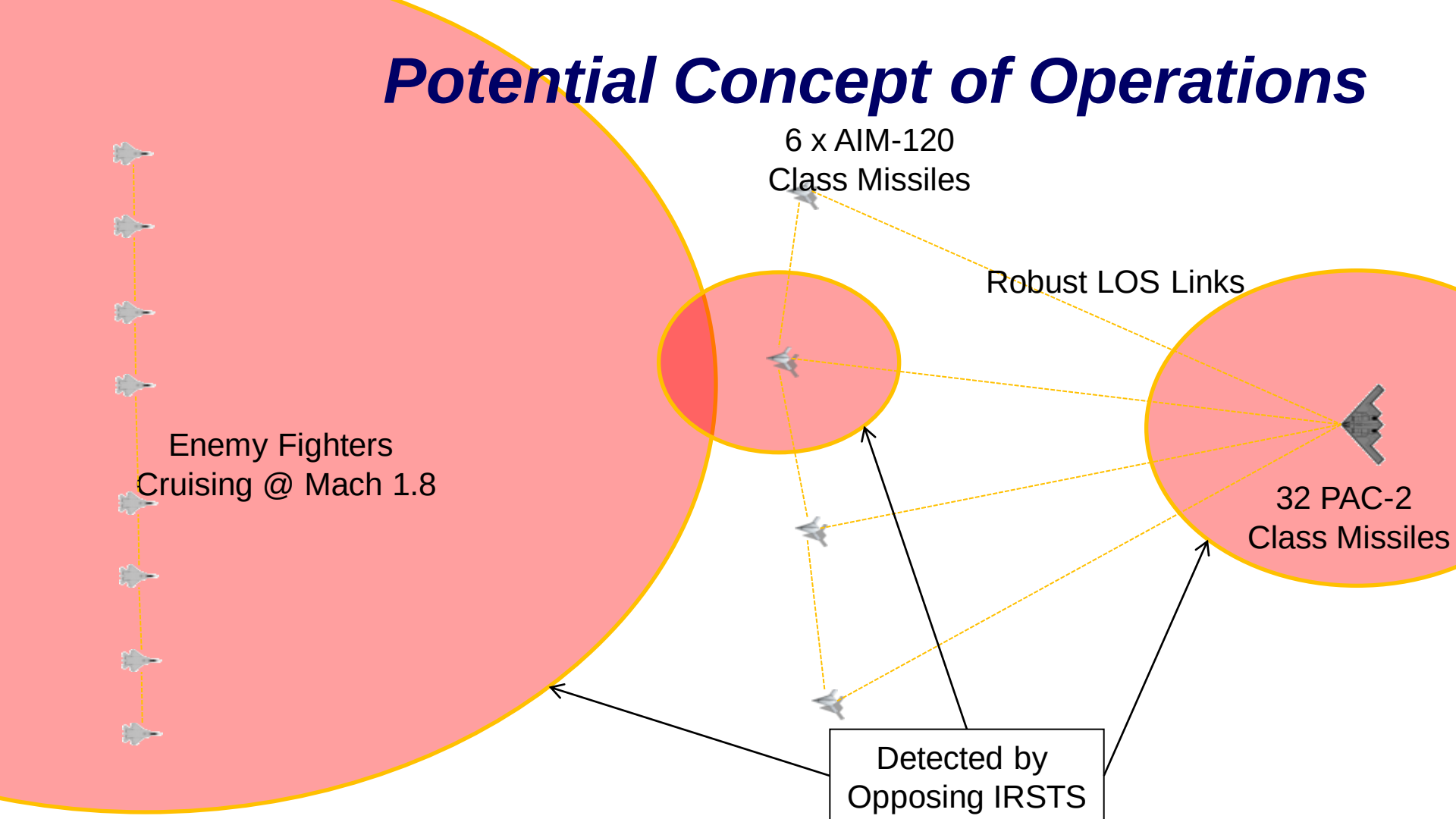
6 x Small UCAS with Passive IRSTS

Robust LOS Links

32 PAC-2
Class Missiles
(Dual Band)

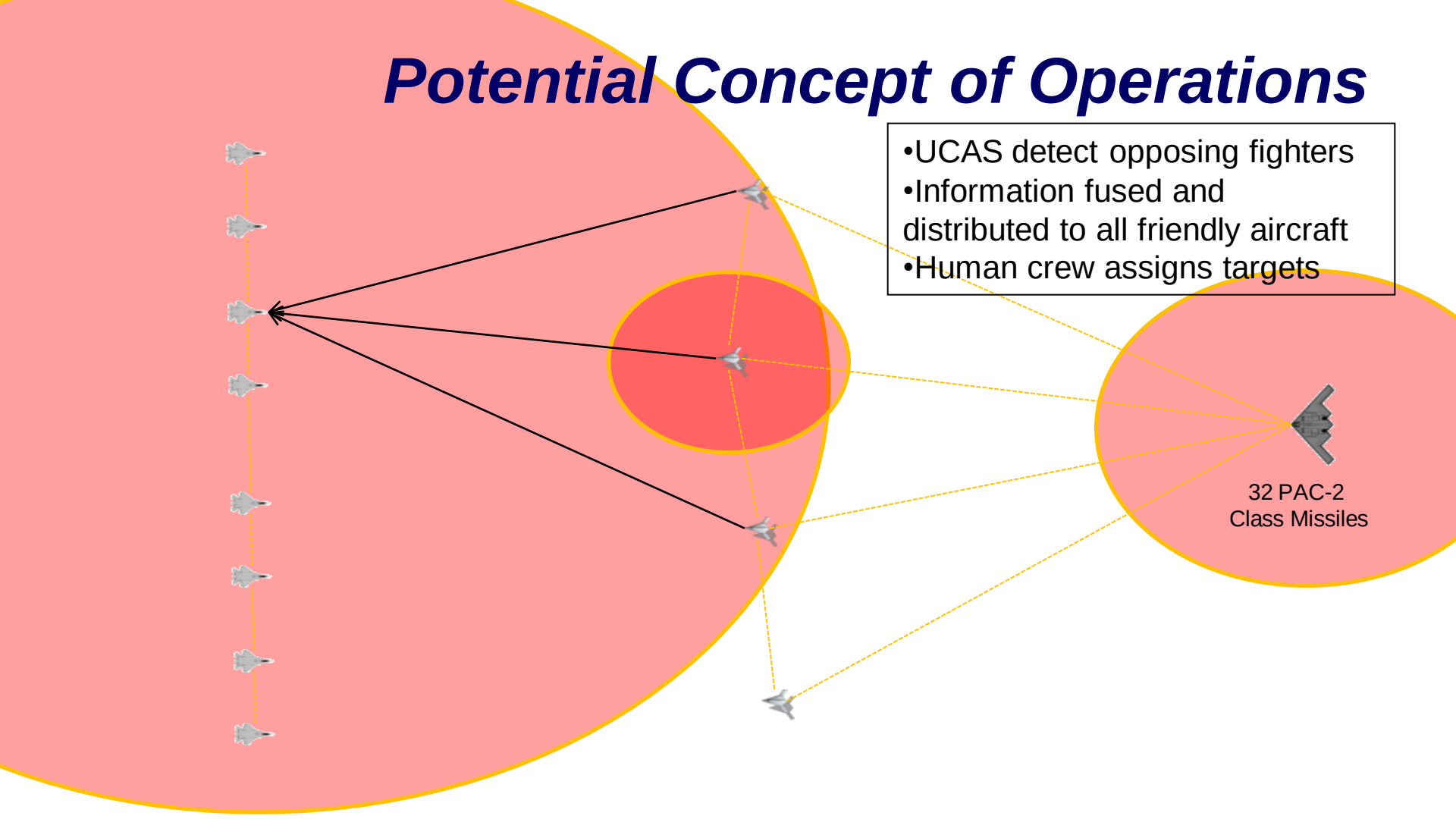
Note: Air mobility aircraft & submarines could be integrated as shooters or to launch UCAS

Potential Concept of Operations

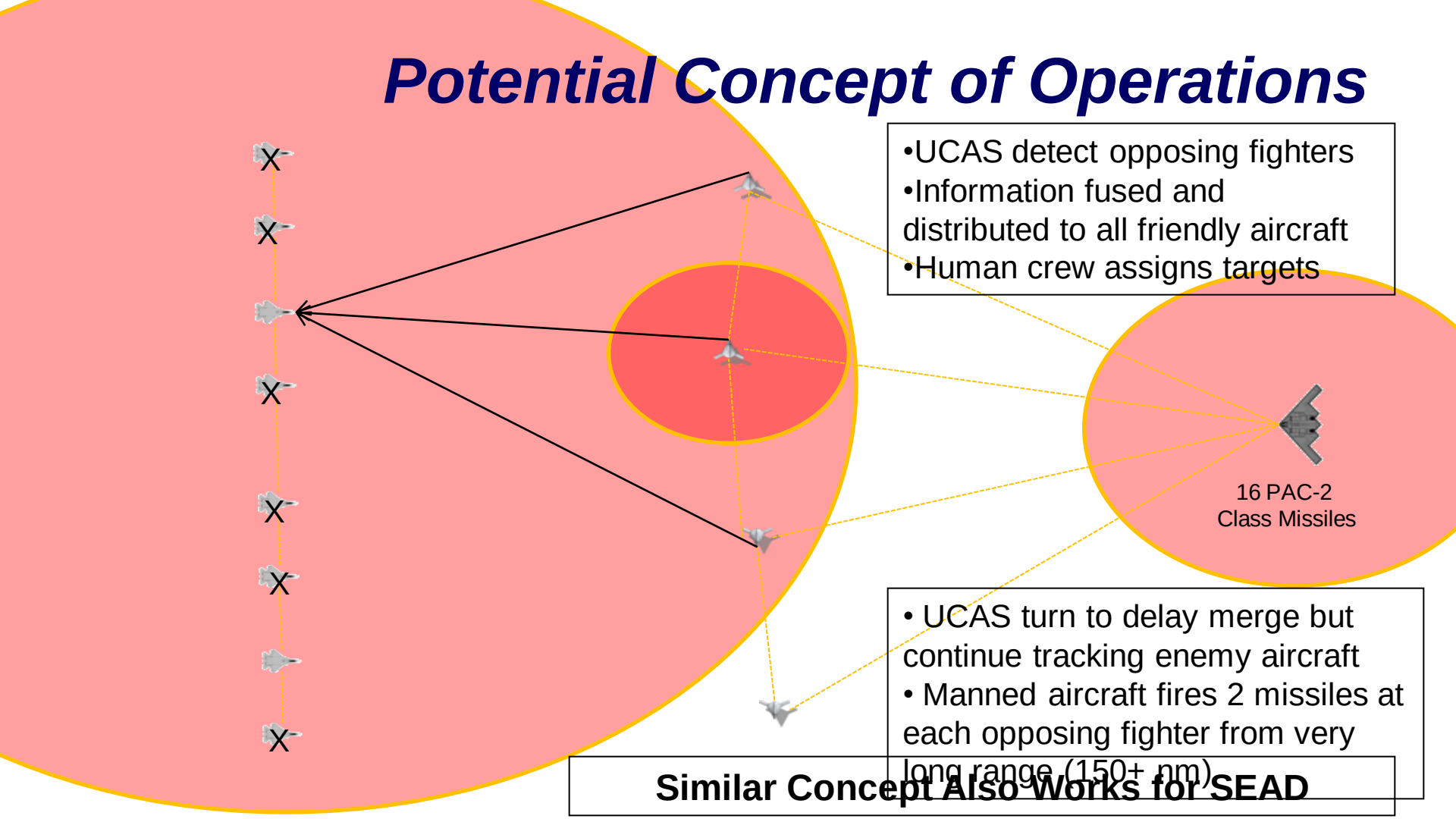


Potential Concept of Operations

- UCAS detect opposing fighters
- Information fused and distributed to all friendly aircraft
- Human crew assigns targets



Potential Concept of Operations



- UCAS detect opposing fighters
- Information fused and distributed to all friendly aircraft
- Human crew assigns targets

- UCAS turn to delay merge but continue tracking enemy aircraft
- Manned aircraft fires 2 missiles at each opposing fighter from very long range (150+ nm)

Similar Concept Also Works for SEAD