

The background of the slide is a blue-tinted collage of various military and strategic images. It includes fighter jets in flight, a satellite in orbit, a tank, soldiers in a field, and a person working at a computer. The text is overlaid on this background.

CSBA

Center for Strategic and
Budgetary Assessments

thinking about

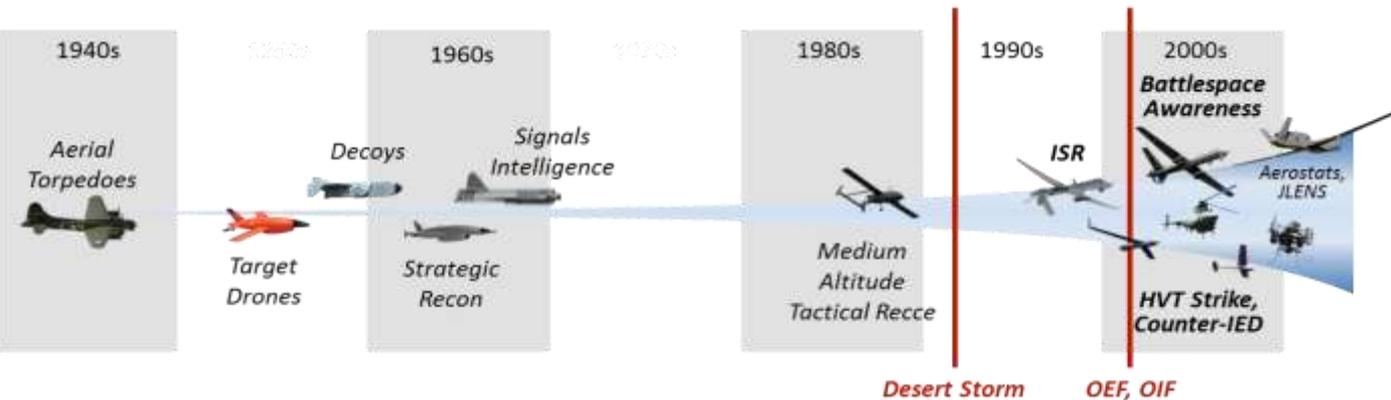
***New Sources of
Military Advantage***

- **Robotic systems**
- **Precision strike capabilities**
- **Directed energy capabilities**
- **A major unknown**

DoD's Crown Jewels

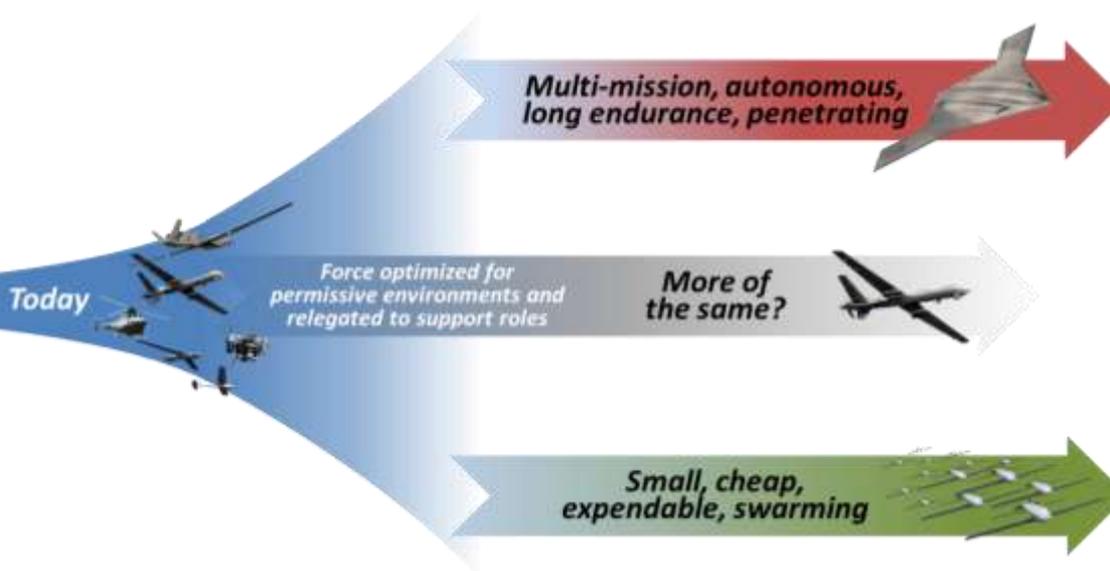
- *Cyber and electronic warfare*
- *Expanded undersea capacity*
- *Survivable, unmanned ISR & precision strike*
- *Directed energy capabilities*
- *Special Operations Forces*
- *Strategic deterrence forces*

Tremendous growth in DoD's unmanned systems



- From 167 UAS in 2000 to well over 11,000 (all UAS groups) today
- However, more than 95% of UAS are still used primarily for ISR missions

Opportunity to create new military advantages



- Long endurance, multiple missions in contested areas? Small, swarming, and expendable to impose costs? High/low force mix? Or more of the same?
- DoD has the opportunity to explore how robotic technologies (not just UAS) could enable new CONOPs instead of limiting them to supporting current CONOPs
- We are in the early stages of a robotics competition – robotic technologies lower the bar to exploit the air domain

- Our post-Cold War conflicts were fought against enemies who lacked effective precision reconnaissance and strike complexes (RSCs)
- China, Iran, and others are developing their own RSCs and capabilities to counter the U.S. military's precision strike advantage

Countering each element of the U.S. "F2T2EA" kill chain

Find

Fix

Track

Target

Engage

Assess

PLA cyber force



DF-21-based ASAT



HQ-9 mobile SAM



C-602 anti-ship cruise missile

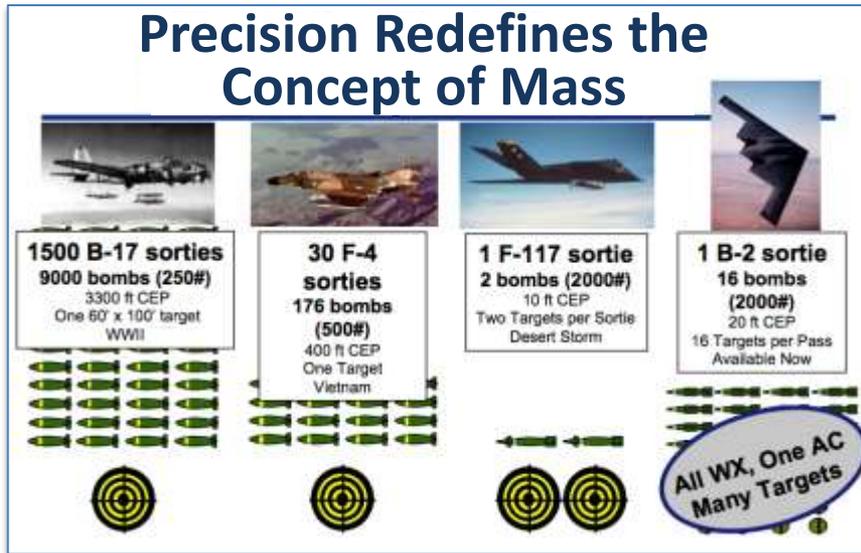


PLAN Gaoxin 3 EW aircraft



Buried, hardened PLA AF facility





New Reality: Precision + Mass

- Additional sorties and larger weapons salvos needed to counter precision defenses
- “One weapon, one DMPI” may be the exception rather than the rule against a target set that is increasingly hardened, deeply buried, mobile, camouflaged, etc.

Future U.S. Power-Projection Forces May Need To:

- Have access to larger theater pre-positioned PGM stocks
- Guard against depleting their most effective and expensive weapons early in campaigns -- use larger numbers of less expensive direct attack (glide, gravity) and mid-range standoff PGMs early, preserve an effective inventory of more expensive, long-range standoff weapons for later operations
- Rely more on PGMs that are survivable, and weapons that can “strike” multiple targets in a single sortie (e.g., CMs with high-power microwave warheads)



Dazzle,
Disable,
Destroy
Sensors



Ground-Based
Radars



Soft UAVs at
Short Ranges



Aircraft,
Cruise Missiles
at Short Ranges



Aircraft,
Cruise Missiles
at Long Ranges



IEDs, Mines,
Ordnance



Power
Equipment,
Cell Towers



Theater Ballistic
Missiles / TEL
Canisters



Soft UAVs at
Long Ranges



Incoming
Artillery Shells



Ballistic Missiles
During
Boost Phase

Directed Energy Weapons



Create a Wide Range of Effects

- ✓ New applications that span the F2T2EA targeting chain
- ✓ Tailorable, selectable effects
- ✓ Lethal and non-lethal effects

Create Favorable Cost-Exchange Ratios

- ✓ Change the missile offense-defense competition calculus in our favor
- ✓ Reduce sustainment requirements
- ✓ Reduce the home vs. away disadvantage for U.S. power-projection forces

Create Advantages in Time

- ✓ Time to engage missiles not driven by flight time of an interceptor
- ✓ Improve ability to counter salvos
- ✓ Create effects before enemy deploys countermeasures

Create Advantages in Magazine Depth

- ✓ Increase mission duration of refuelable manned and unmanned aircraft
- ✓ Increase time on station for naval forces
- ✓ Increase potential for platforms to carry other mission packages

- High-energy, solid-state laser weapon as a sea-based force multiplier
 - Help reduce requirements for expendable munitions and possibly reduce some costs
 - Free capacity to carry weapons for offensive operations



Missions	Weapons	Wartime Loadout	Maximize Time on Station	Maximize BMD Capabilities	Maximize Strike Capabilities
Anti-Air Warfare	DDG Laser Defenses	0	2	2	2
	SeaRAM CiWS	21 (deck)	21	21	21
	Evolved Sea Sparrow Missiles	32 (8 cells)	220 (55 cells)	32	32
	Standard Missile 2	32	10	10	10
	Standard Missile 6	34	17	17	17
Ballistic Missile Defense	Standard Missile 3	6	6	53	6
Anti-Surface Warfare	Anti-Submarine Rockets	8	4	4	4
Strike	Tomahawk Cruise Missiles	4	4	4	51
	Multiplier	Baseline	x12 Time on Station	x10 BMD Capacity	x13 Strike Capacity

New DE and rail gun capabilities are opportunities to regain an advantage in the missile competition

DE and kinetic weapons are complementary

In Combination: Potential to Increase Our Offensive Punch From The Sea

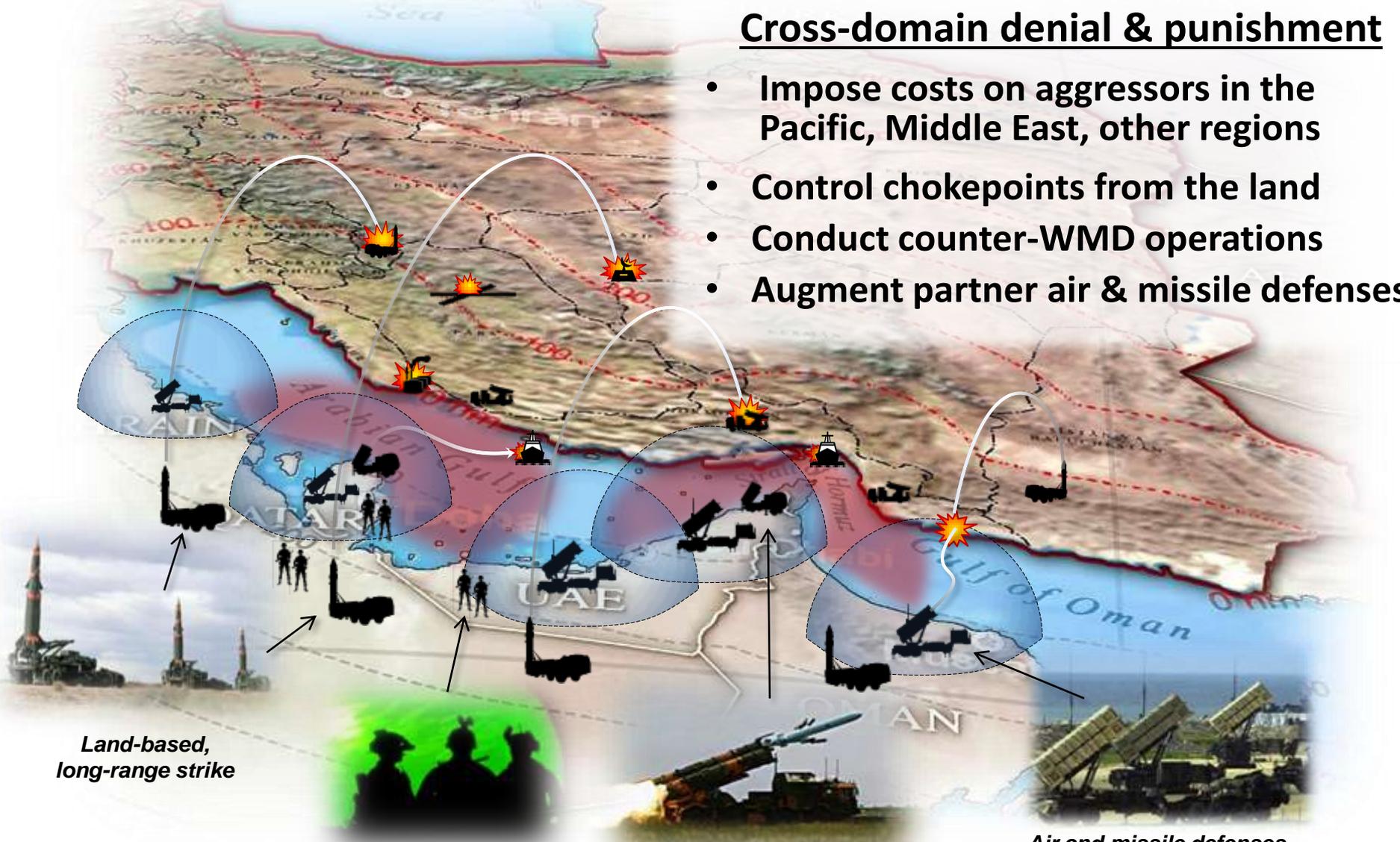
- **Field long-range, survivable unmanned combat air systems that extend the offensive reach of carrier battle groups in contested areas**
- **Increase the payloads of manned and unmanned capabilities that operate in the access-insensitive undersea environment**
- **Develop new PGMs that can create a range of effects against more challenging target sets**
- **Leverage non-kinetic capabilities to create cost/exchange ratios favorable to the United States**



Its Not All About New Technologies -- New Operational Concepts Are Needed

Cross-domain denial & punishment

- Impose costs on aggressors in the Pacific, Middle East, other regions
- Control chokepoints from the land
- Conduct counter-WMD operations
- Augment partner air & missile defenses



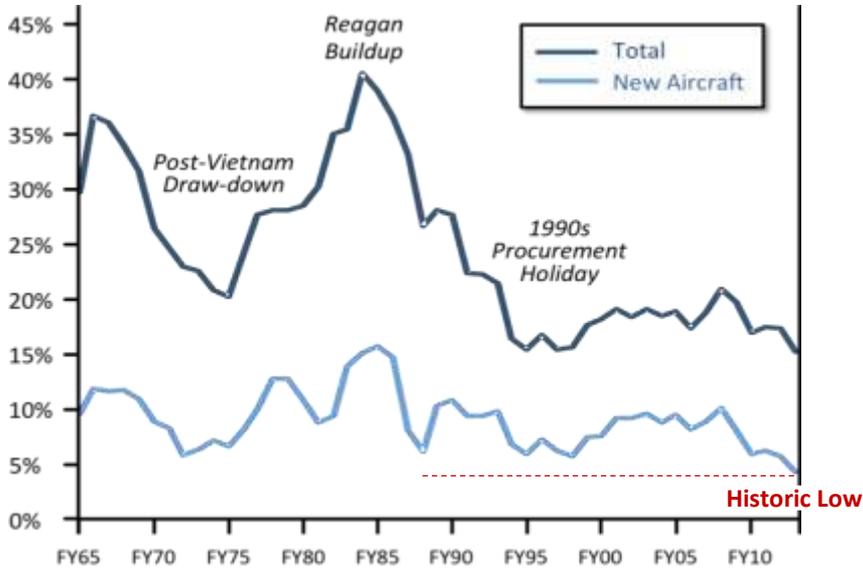
*Land-based,
long-range strike*

*Leveraging the indirect
approach: SFA, BPC*

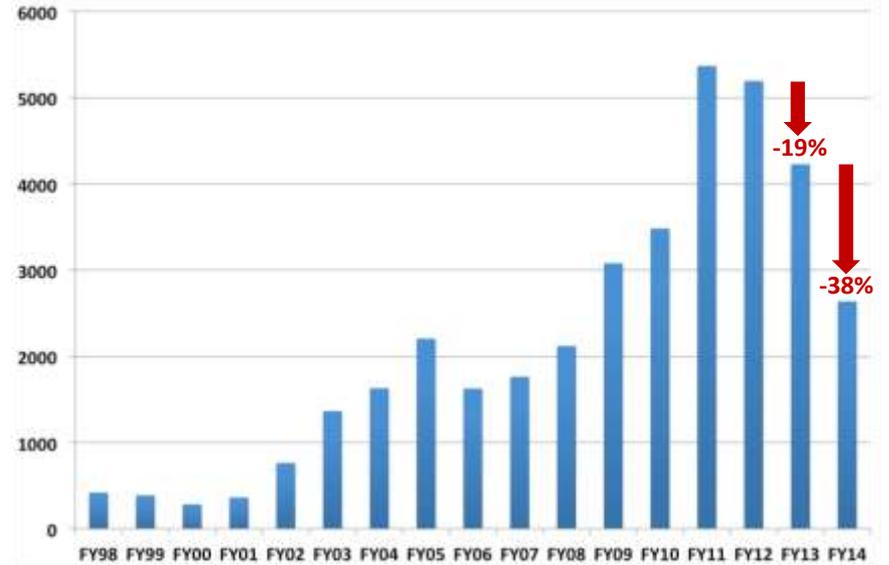
*Land-based
sea denial*

*Air and missile defenses,
including rail guns*

Air Force Aircraft Procurement (as % of TOA)

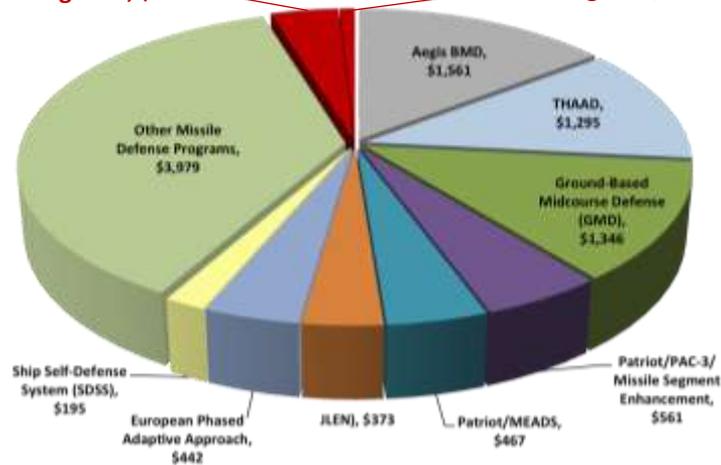


DoD UAS Proposed Investments (\$m)

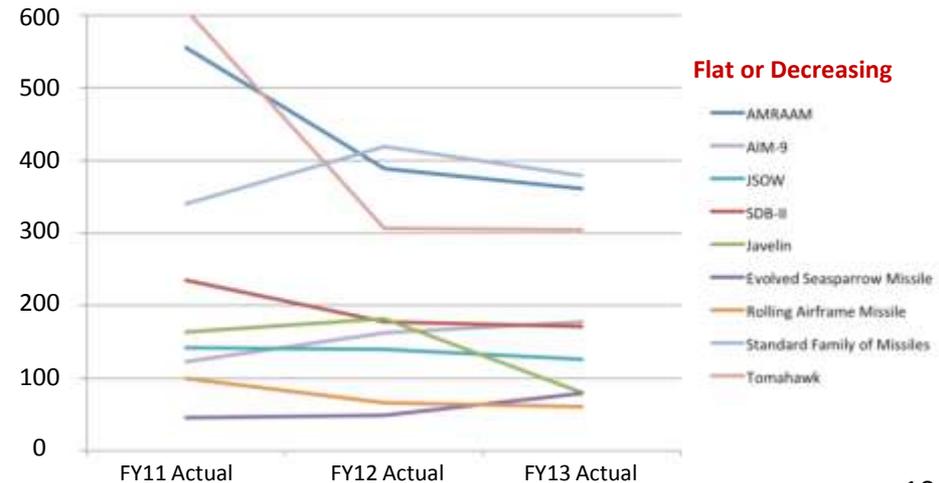


DE v. Kinetic Missile Defense Programs (\$m)

HEL Programs, \$414 HPM Programs, \$91



Example PGM Investments (\$m)



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