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The Need for a Cost-effective Air Force PGM Mix for Great Power Conflict

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The Air Force's legacy PGMs are increasingly unsuitable for a 5th generation combat force

> **"You're not a true fifth-gen Air Force until your fifth-gen fighters have fifth-gen weapons and fifth-gen sensing"**
>
> **Gen Mark Kelly, ACC Commander**

Five Recommendations for the future munitions inventory

1. **Maximize the Air Force's 5th gen advantage.**
   Prioritize precision-guided munitions (PGMs) that enable the Air Force to take full advantage of the survivability, range, and payload capacity of its penetrating 5th generation fighters and stealth bombers

2. **Fill the gap between long-range stand-off & direct attack PGMs.**
   Acquire a family of mid-range (50 nm to 250 nm) weapons that can be delivered by penetrating aircraft on 100,000-plus aimpoints during a peer conflict

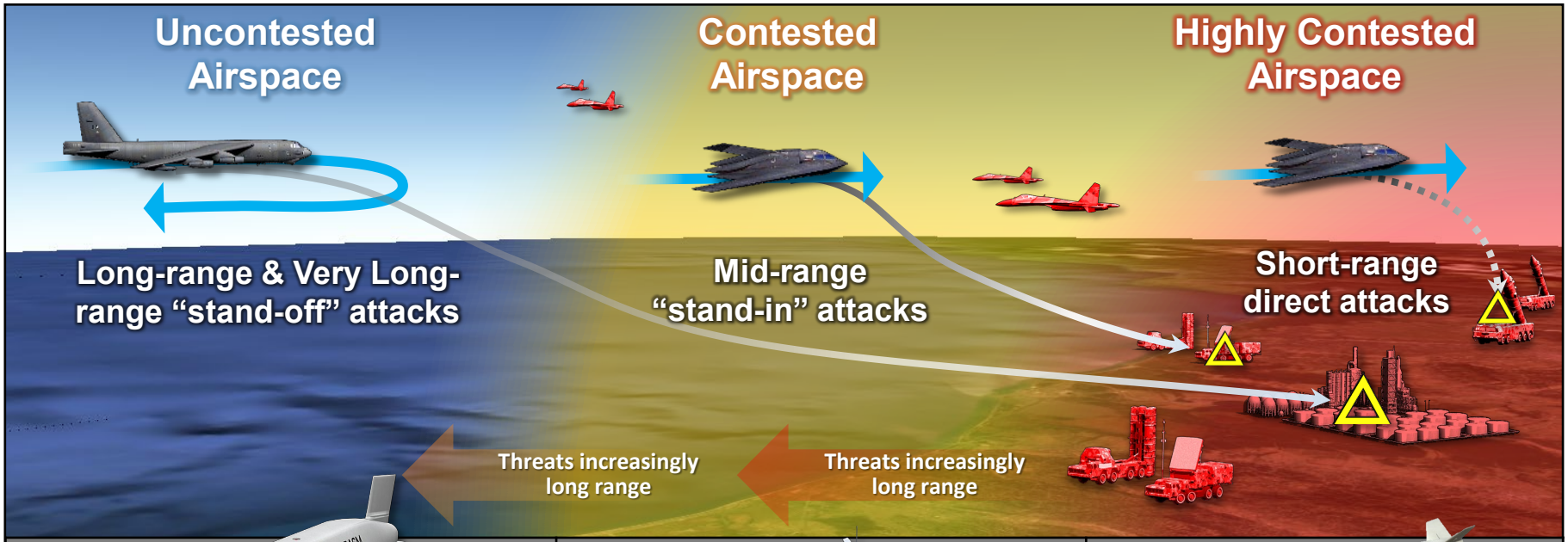
Five recommendations (continued)

3. **Increase PGM survivability to reduce sortie requirements.**
   Design next-generation mid-range PGMs to penetrate advanced air defenses to reach their designated aimpoints

4. **Increase lethality against challenging targets.**
   The USAF's PGM mix must be effective against target sets that are increasingly mobile, relocatable, hardened, deeply buried, and distributed over wide areas

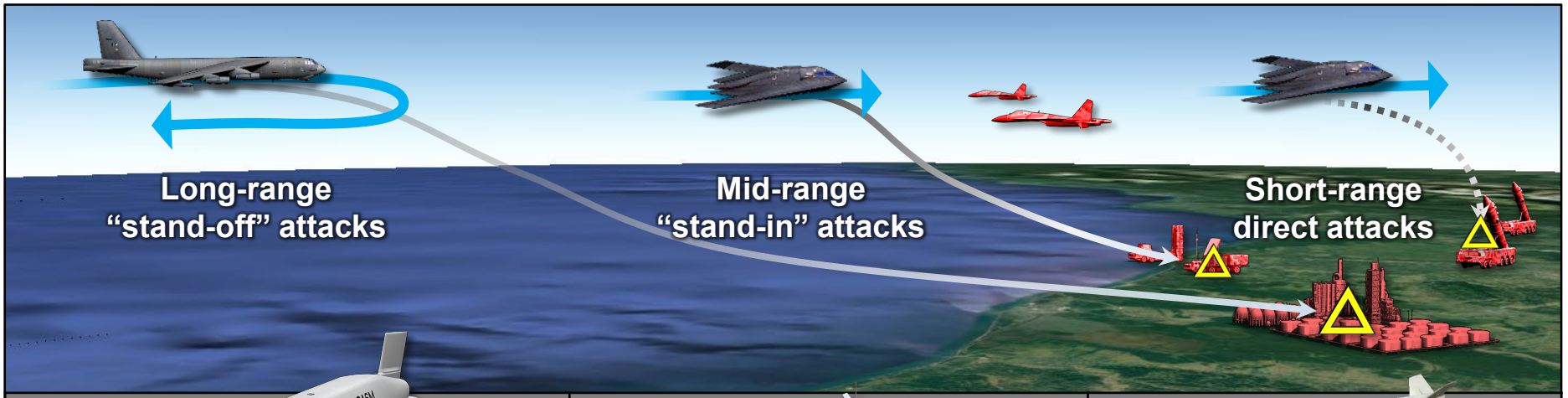
5. **Maximize the Air Force's bang for the buck.**
   Ideally, mid-range PGM unit costs should be less than $300,000 if the Air Force is to procure them at scale considering the likelihood of flat or declining budgets

Describing “stand-off” and “stand-in” strikes



Long/Very Long-range Stand-off Weapons	Mid-range Stand-in Weapons	Direct Attack Weapons
JASSM-ER, Tomahawk cruise missiles, etc.	SDB II, Joint Standoff Weapons, etc.	JDAMs, Quickstrike mines, etc.
• Long-range = 250 to 750 nm • Very long-range > 750 nm • Typically powered to extend range • Non-stealth aircraft may need 500 nm or greater stand-off ranges to attack targets in contested areas	• Mid-range = 50 to 250 nm • Winged/glide capable, may also be powered to extend range • Enables attacks while avoiding short-range “point” defenses surrounding high-value targets	• Ranges of single digits to very low 10s of nautical miles • Weapons are typically unpowered • Must be released very close to targets

Inventory is unbalanced: mostly direct attack and a much smaller number of stand-off PGMs



Long/Very Long-range Stand-off Weapons	Mid-range Stand-in Weapons	Direct Attack Weapons

Too far — **“Sweet spot” for penetrating strikes** — **Too close**

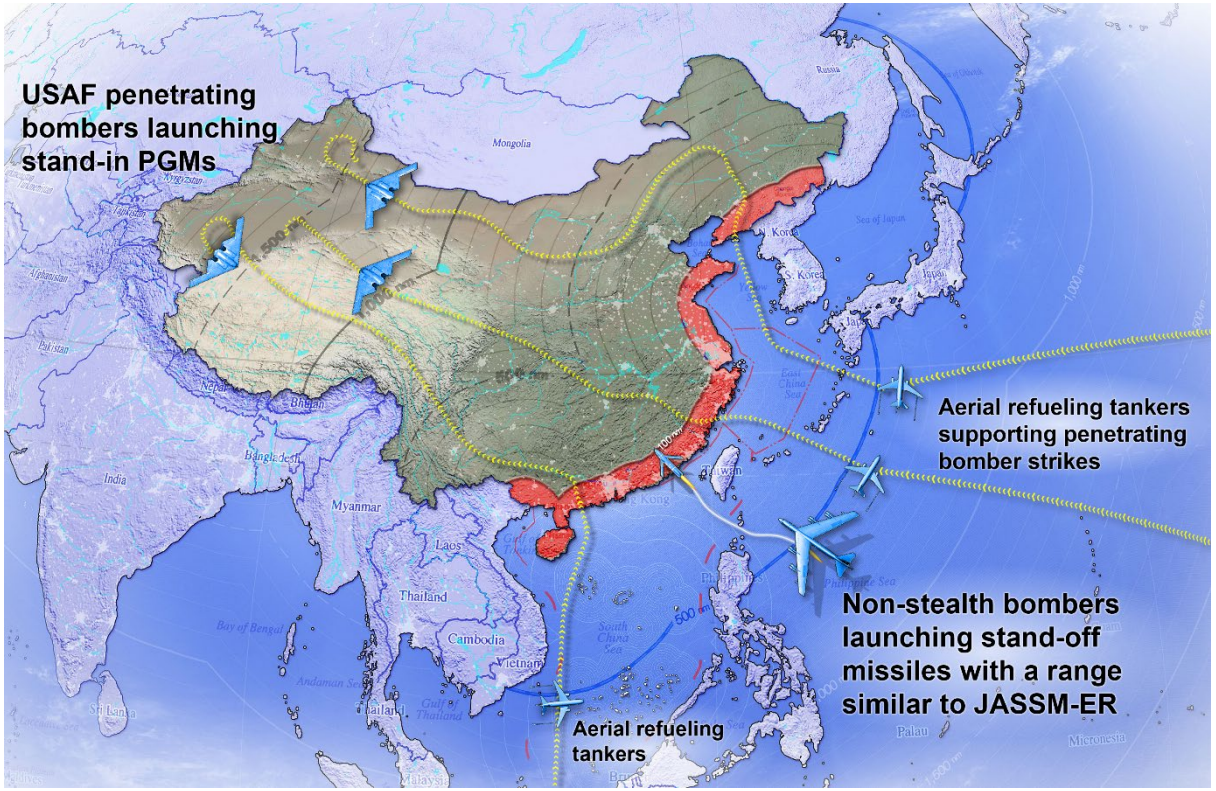
- Increasing weapons range increases their size, which reduces weapons per sortie (targets per sortie)
- Longer flight times can reduce effectiveness against mobile/relocatable targets
- Typically carry smaller warheads, reducing their effectiveness against hardened/deeply buried targets
- Higher costs reduce PGM scalability

- **There is a gap in the Air Force’s PGM inventory**
- **Needed: A family of next-gen mid-range (50–250 nm) PGMs for stand-in strikes**

- Increases risk to penetrating aircraft — reduces ability to avoid lethal short-range “point” defenses around high-value targets

Mid-range PGMs for stand-in attacks would increase lethality of the USAF's 5th & 6th gen forces

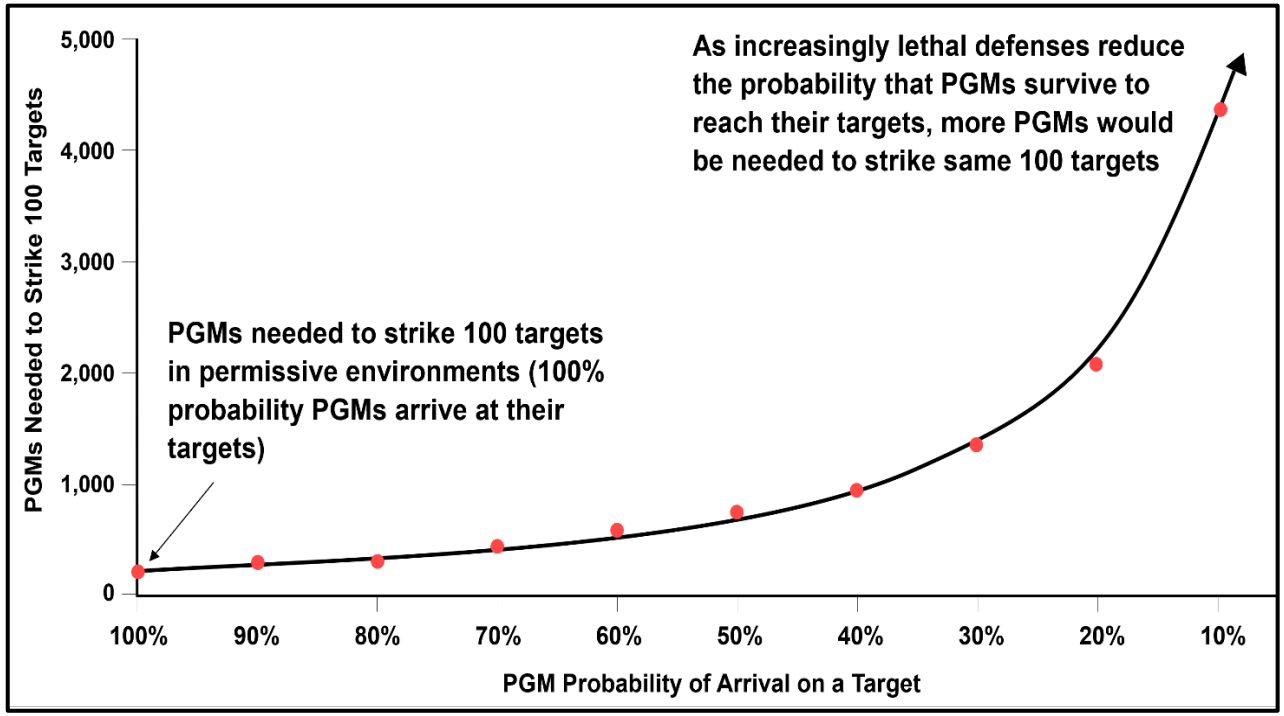
- **Deny adversaries rear-area sanctuaries:** Enable penetrating strikes against large target sets (100,000 or more aimpoints) that are increasingly mobile, relocatable, hardened, deeply buried, and distributed over very large areas
- **Provide just enough standoff:** Enough weapons range for stealth aircraft to avoid short-range point defenses without inordinately increasing weapon size



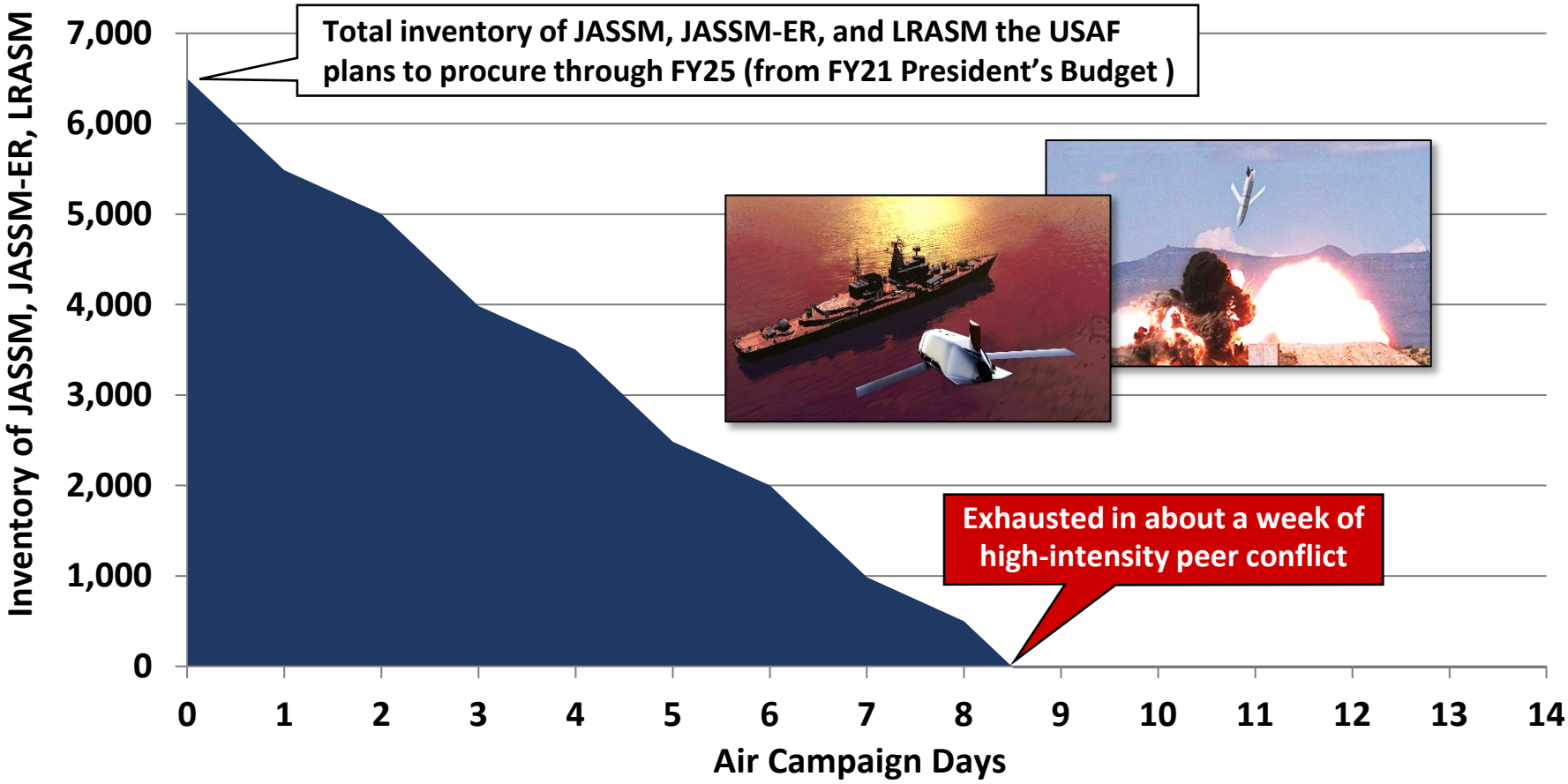
- **Size counts:** Smaller sizes of mid-range weapons would help maximize targets per sortie: increasing aimpoints attacked over in short periods of time can be decisive
- **Cost per target also counts:** Lower costs increase the USAF's ability to procure PGMs at scale needed for peer conflict

Another reason why a 5th gen force needs 5th gen weapons

- **Advanced IADS are increasingly capable against the Air Force's legacy weapons as well as its 4th gen combat aircraft—this can grow weapon and sortie requirements**
  - The Air Force's acutely diminished size and insufficient budget means it cannot shift from many targets per sortie back to many sorties per target
- **A better choice: Design mid-range PGMs to survive in contested environments, which will help maximize targets per sortie and the USAF's bang for the buck**



The USAF's PGM inventory also lacks capacity for a major conflict with China or Russia

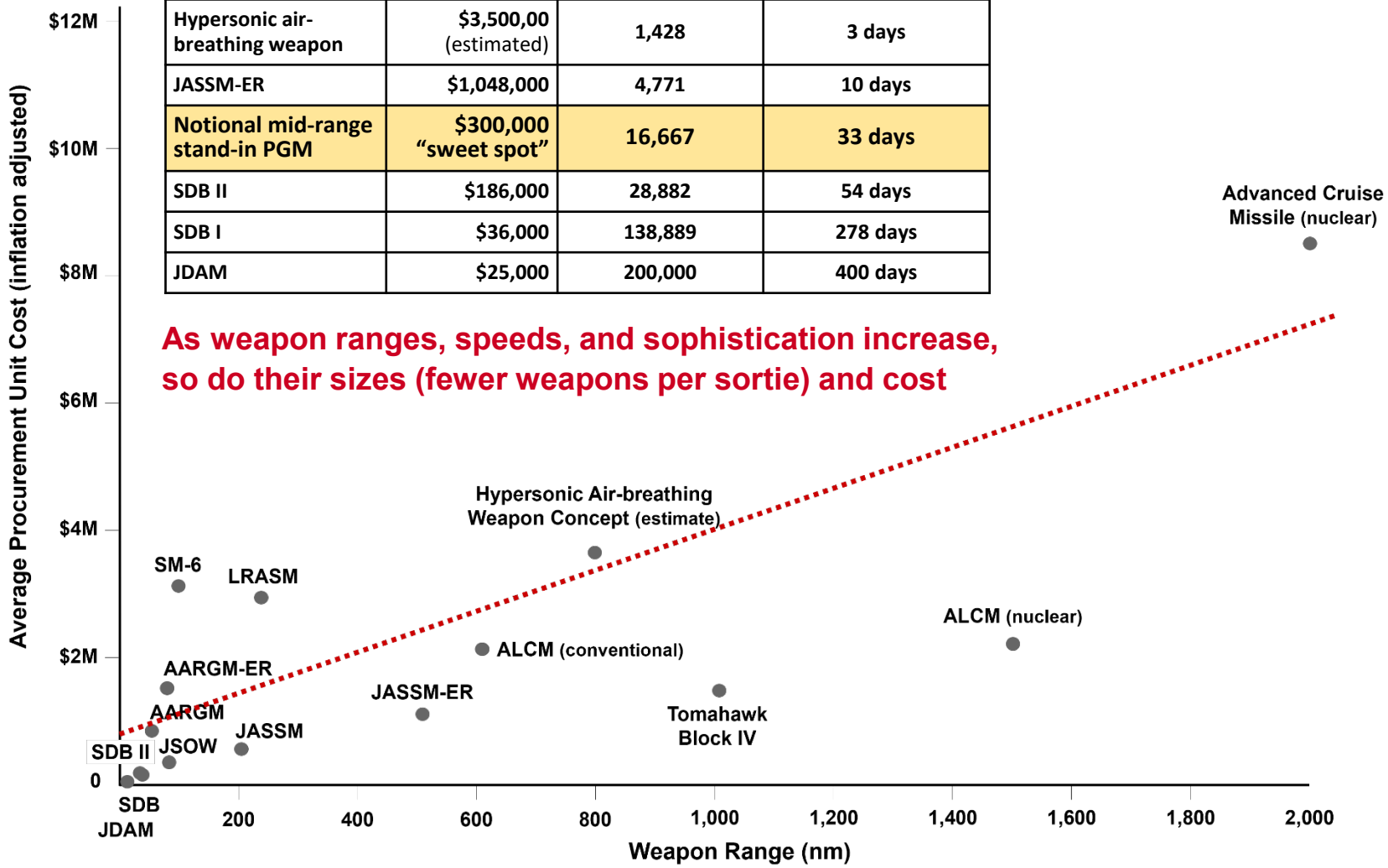


- DOD has chronically underfunded its PGM requirements – risk was acceptable in the past, but not in an era of renewed great power competition and conflict
- Higher cost of long-range and very long-range PGMs is a critical factor

Must seek the right balance between PGM ranges, speeds, survivability, and weapons per sortie

Weapon	Unit Cost	Number $5 billion could buy	Assuming launch 500/day
Hypersonic air-breathing weapon	$3,500,00 (estimated)	1,428	3 days
JASSM-ER	$1,048,000	4,771	10 days
Notional mid-range stand-in PGM	**$300,000 "sweet spot"**	**16,667**	**33 days**
SDB II	$186,000	28,882	54 days
SDB I	$36,000	138,889	278 days
JDAM	$25,000	200,000	400 days

As weapon ranges, speeds, and sophistication increase, so do their sizes (fewer weapons per sortie) and cost



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Inventories of very long-range hypersonic weapons may be small ("silver bullets")

Ground-launched Long Range Hypersonic Weapon $40M (est.)

Hypersonic Air-launched Rapid Response Weapon (ARRW)

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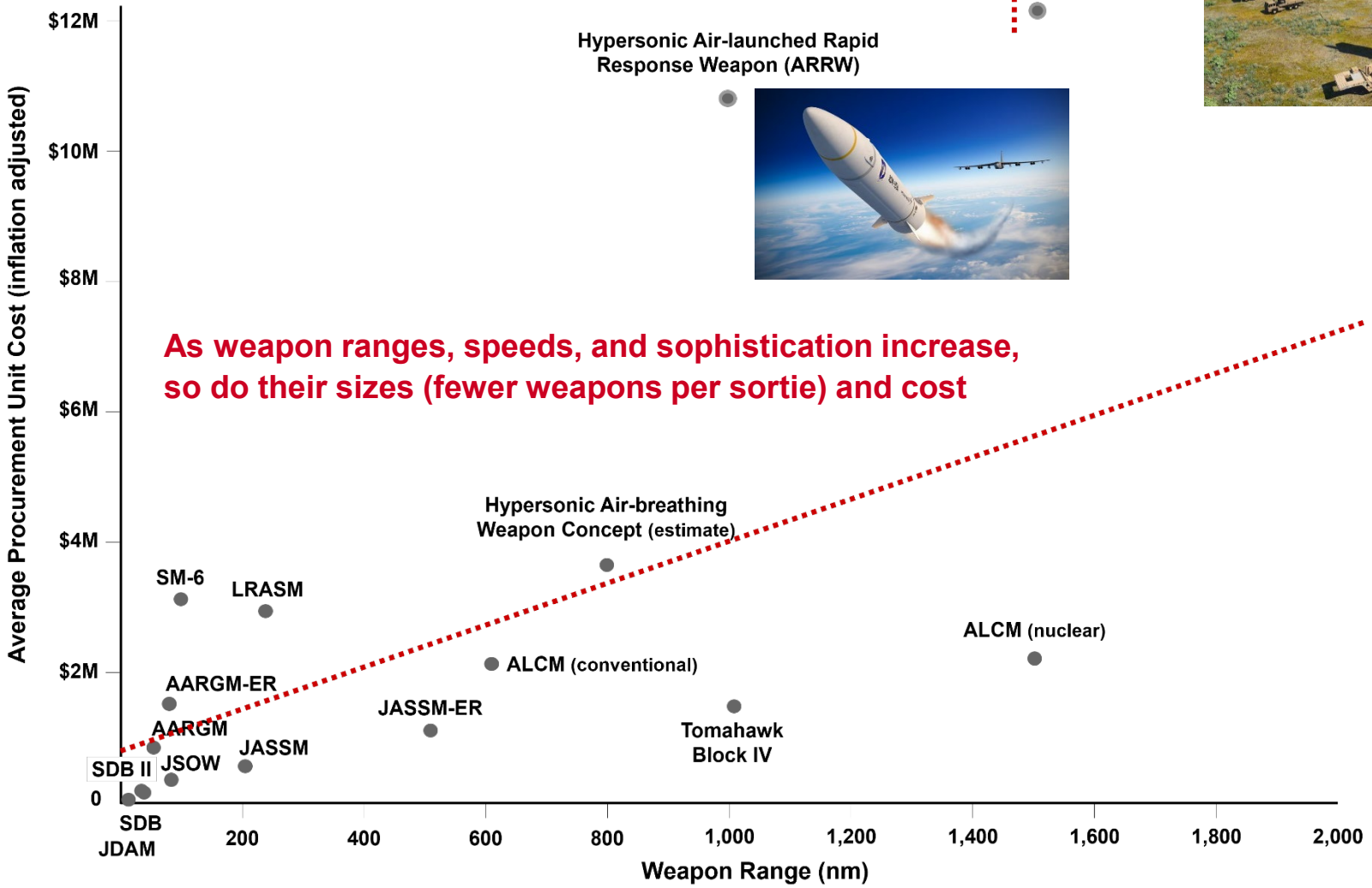

"The Air Force will require a mix of affordable, cutting-edge air-to-air and air-to-ground kinetic and non-kinetic weapons to defeat rapidly evolving peer competitors" HQ USAF, 2021

1. Maximize the Air Force's 5th gen advantage
2. Fill the gap between long-range stand-off weapons and short-range direct attack weapons
3. Increase PGM survivability to reduce sortie and weapon requirements
3. Increase lethality against challenging targets (mobile, relocatable, hardened, or deeply buried)
4. Maximize the Air Force's bang for the buck

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