

Department of the Navy



AirSea Battle: Power Projection in the Mature Guided Munitions Era

*Hon. Robert O. Work
Under Secretary of The Navy*

**AIE Counter A2/AD Conference
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This brief is about power projection in the mature guided munitions era

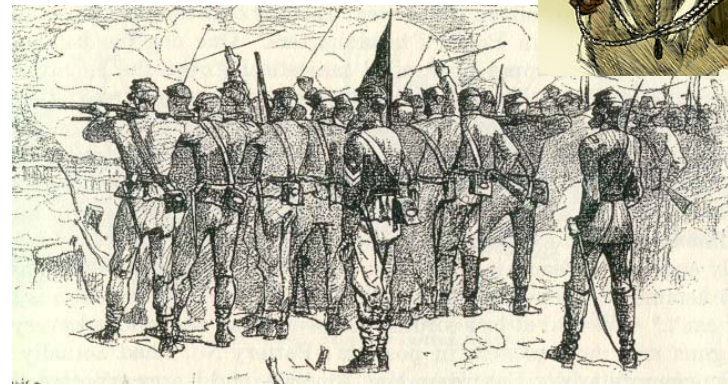
“...the information age is nothing new...The role of information (scouting) reached fruition in the 1930s with the fusion of air-search and radio communications. Information warfare and operations are indeed evolving with technology, but in most respects they are an extension of the [World War II sensory revolution] with minor changes. *What we have seen...is a new weapon—the well-aimed, long-range missile—to take advantage of sensing and communicating technology, and vice versa.*”

Captain Wayne P. Hughes, Jr.
Fleet Tactics and Coastal Combat, p.4



Up through World War II, combat was waged exclusively with unguided munitions

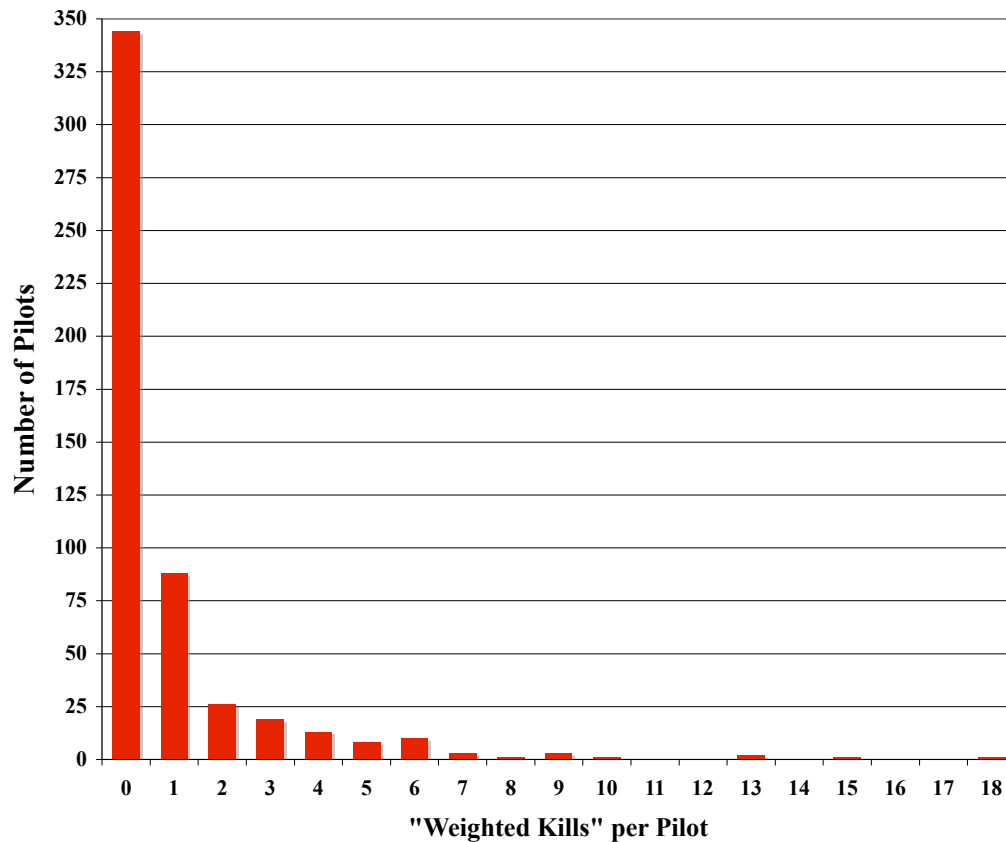
- As soon as rocks and spears were thrown in battle, and particularly once slings and bows and arrows appeared, the contested zone between opposing forces quickly expanded up to hundreds of yards
- Indirect fire (e.g., artillery and mortars) eventually expanded the contested zone to tens of miles; air-dropped munitions eventually expanded the zone to hundreds of miles
- This warfighting regime had one central characteristic: *most munitions that were thrown, propelled, fired, launched, or dropped ultimately missed their targets—increasingly so over range*
- This characteristic is expressed in very high **circular error probable (CEP)** results for unguided munitions





Even in close-in, line-of-sight combat, only a few gifted individuals flourished

**Distribution of 520 F-86 Pilots by
"Weighted Kills" in MiG Alley**



“You can count on about three, if you are lucky, of your pilots in the squadron to possess those things necessary to be exceptional leaders and produce more than an occasional kill or two.”

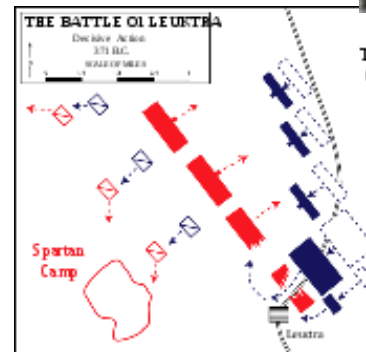
— Major “Boots” Blesse, 1954
No Guts, No Glory



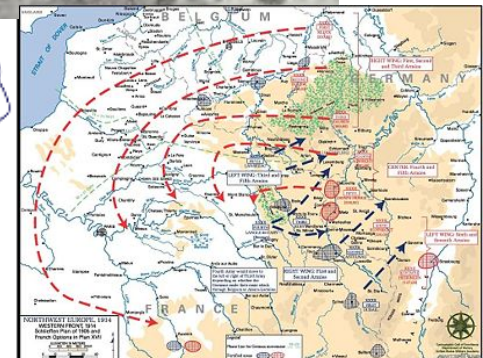


Unguided munitions warfare thus had an inherent bias towards mass

- Unguided munitions warfare:
 - Most projectiles that are thrown, shot, fired, or dropped **miss their targets (increasingly so as range increases)**
 - Average CEP for air-dropped ordnance in WWII was 3,300 feet
 - **Rate-of-fire and density of barrage** far more important than munitions range
 - **Munitions range is dependent on cost**; lack of accuracy means the cost premium for long range munitions was rarely worth it
 - **Collateral damage an accepted fact of life**
- Maneuver in the unguided munitions warfare regime also often sought to gain a local advantage in mass (3:1 in the attack)



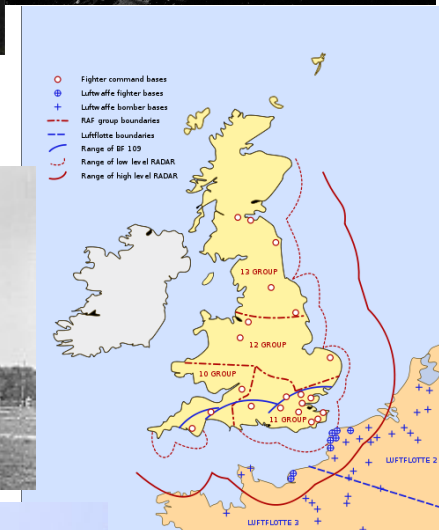
Theban Camp





During WWII, the first steps away from unguided weapons warfare occurred with the appearance of modern battle networks

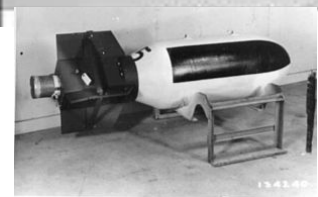
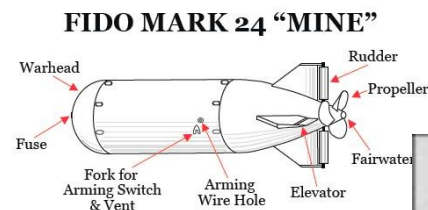
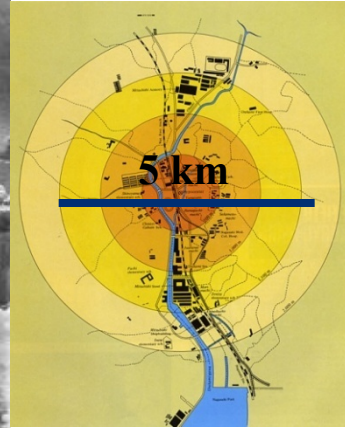
- **Battle Network:** Three vertically-linked grids which operate together as a single cooperative and adaptive fighting network:
 - Sensor grid (*common battle network picture*)
 - C3I grid
 - Effects grid
- First came **tactical battle networks** which engaged specific targets in discrete operating domains
 - British IADS
 - German IADS
 - US Fleet Air Defense Network
- Battle networks helped take surprise out of enemy attacks; however, with unguided weapons, mass v mass engagements were still the norm





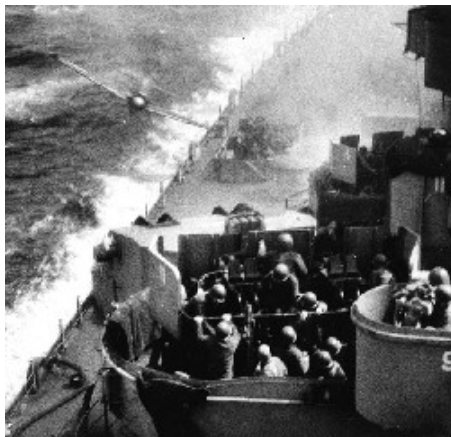
Then came two technical alternatives to unguided weapons warfare

- **Atomic munitions** solved the problem of large CEPs by delivering one enormous pulse of destructive firepower
- **Guided munitions** solved the problem of large CEPs by actively corrected for individual-aiming or subsequent errors while homing on their targets or aim-points after being fired, released, or launched, thereby reducing CEPs to allow the munitions to achieve effects on target





Both battle networks and guided munitions played big roles in AirSea Battle (I): The Battle for Okinawa



- The battle off Okinawa in 1945 saw a mature US unguided munitions battle network take on dense Japanese guided missile salvos
- The results were sobering:
“Approximately 2,800 *Kamikaze* attackers sunk 34 Navy ships, damaged 368 others, killed 4,900 sailors, and wounded over 4,800. Despite radar detection and cuing, airborne interception and attrition, and massive anti-aircraft barrages, a distressing **14 percent of *Kamikazes* survived to score a hit on a ship;** nearly 8.5 percent of all ships hit by *Kamikazes* sank.”

Dr. Richard P. Hallion,
“Precision Weapons, Power-Projection, and the
Revolution in Military Affairs”



The implications of AirSea Battle (I) were clear

- In the unguided weapons regime, massive salvos were needed to achieve a target hit. **In the guided weapons regime, a salvo only had to be dense enough to saturate an opponent's defenses; any leaker would likely hit the target, with devastating results**
 - Burden on defenses would therefore be very high
- Guided weapons could help reduce the defensive burden
- Future combat outcomes between opposing battle networks would hinge around guided munitions salvo competitions
 - “Attack effectively first” would be a key objective in guided munitions warfare





Based on its experience, the US Navy made a general shift towards (defensive) guided munitions after World War II

- First Navy response to jet aircraft armed with guided missiles and nuclear submarines armed with homing torpedoes and guided missiles (**all with atomic warheads**) was to improve its counterforce capacity: the US Surface Navy developed guided weapons for fleet air defense and anti-submarine warfare:
 - The “three T’ s”
 - Homing torpedoes replace depth charges
 - DASH and LAMPS (manned aerial torpedo delivery vehicles)
 - All-missile-armed fleet interceptors
- The surface community did not pursue guided anti-ship missiles and the naval aviation community generally ignored air-to-ground guided weapons
 - Sole exception: Bullpup radio-controlled guided missile
- In contrast, the submarine community built no unguided torpedoes after 1944
- Move towards guided weapons was accompanied by a simultaneous move toward computer-aided tactical battle networks (NTDS) and operational battle networks (SOSUS/IUSS)





Other warfighting communities also embraced defensive guided munitions and battle networks

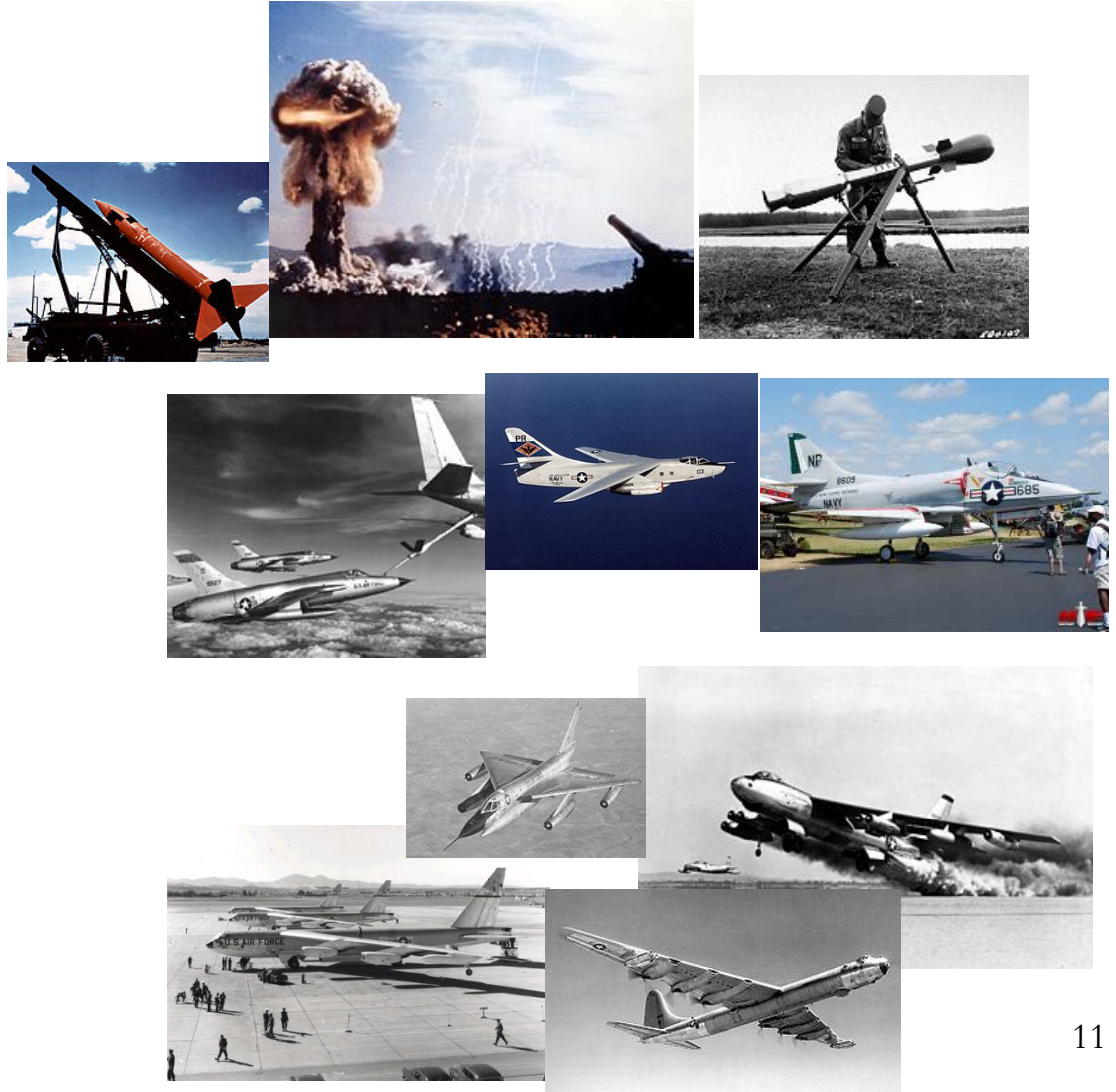


- Generally, the regime first movers were communities that engaged targets that moved freely in two or three dimensions
 - Army air defenders
 - Nike Ajax and Hercules
 - SAGE
 - Air Force air-to-air community
 - Falcon
 - Sidewinder
 - Sparrow
- In the early guided weapons regime, atomic warheads were used to compensate for lack of reliable terminal guidance (for both guided and unguided weapons)



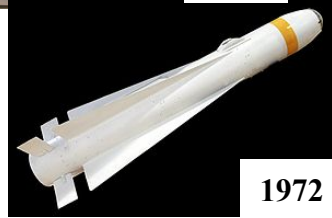
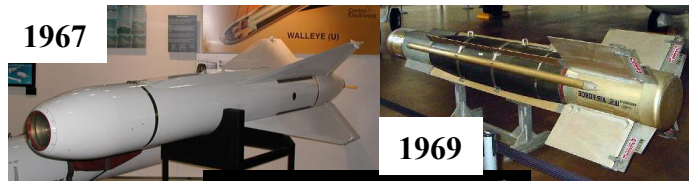
Throughout the 1950s, however, atomic weapons were the clearly preferred weapons of choice for offensive operations

- The atomic detour:
 - Tactical nuclear air-to-ground gravity bombs
 - Strategic nuclear air-to-ground gravity bombs
 - Atomic weapons and munitions were the primary ground strike weapons for the Army's Pentomic Division (release authority to Battalion Commander)
- Conventional air-to-ground operations still relied on "dumb" bombs, with CEPs averaging no better than 500 feet
 - Razon, Tarzon used in small numbers during Korean War
 - Bullpup missile developed





Guided air-to-ground conventional munitions came into their own during the Vietnam War



- Unguided munitions proved no match for an IADS employing guided missiles
 - Within three years, new families of guided munitions began to appear
- Electro-optical
 - Walleye
 - HOBOS
 - Maverick
- Laser Guided
 - GBU series
- Anti-radiation
 - Shrike
 - Standard ARM



Ultimately, over 28,000 guided air-to-ground munitions were expended over the course of the war

- 10,500 guided munitions were dropped from Feb 72 through Feb 73, during operations Linebacker I and Linebacker II
 - Predominately LGBs and anti-radiation missiles
 - 5,107 direct hits (48%); another 4,000 achieve CEPs of 25 feet or less (LGBs average less than 15 feet)
 - Guided munitions opened up attacks on targets with restrictive ROEs
 - LGBs used to take out generators at Lang Chi hydroelectric plant without breaching the earthen dam on which they were located
- Between April 6 and end of June 1972, 8th TFW dropped 106 bridges using guided munitions
 - Paul Doumer bridge dropped in May 1972; not repaired until 7 months after the war
 - 16 F-4Ds using 2,000-lb GBU-10s in two separate attacks
 - Prior to this attack, Air Force had flown 871 sorties against the target, losing 11 planes in the process
- Helicopter air-launched guided missiles also proved effective; in 1972, wire-guided TOW anti-tank missile proved its worth
 - 162 fired; 151 guided (93%); 124 target hits (82%)
 - General effectiveness of ATGMs was confirmed in the 1973 Yom Kippur War





The Vietnam War thus helped to illuminate the implications of guided munitions warfare

- **Unguided munitions warfare:**

- Most projectiles that are thrown, shot, fired, or dropped **miss their targets (increasingly so as range increases)**

- **Rate-of-fire** far more important than munitions range

- **Munitions range is dependent on cost**; lack of accuracy means the cost premium for long range munitions was rarely worth it

- **Collateral damage an accepted fact of life**

- **Guided munitions warfare:**

- Munitions have a good chance of hitting their targets; **accuracy is independent of range**

- **Maximum effective range and Pk more important than rate-of-fire or density of barrage**

- **Range is still dependent on cost** (and costs for guided munitions are uniformly higher than for unguided weapons), but operational ROI much higher

- **Over time, collateral damage far less acceptable**

- **Operator skill no longer so important**; weapon does much of the work

1975: Long Range Research and Development Planning Program

- “Near zero miss” conventional weapons could substitute for “massive nuclear destruction”
- Conceptualized new reconnaissance strike capabilities with advanced sensors and all weather guided munitions



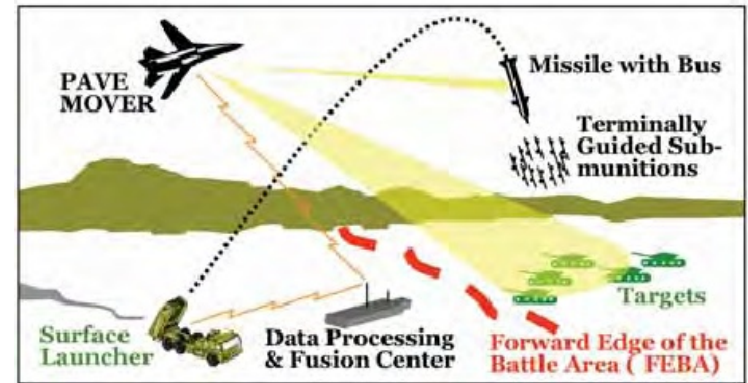
After the war, however, the revolutionary spark did not fully catch fire within the air-to-ground community

- In the Air Force:
 - Leaders touted dramatic contribution of B-52s massed dumb bomb strikes rather than LGBs
 - Meanwhile, persistent cloud cover in the European theater (9 months of the year) served to depress the appetite for both Laser and EO weapons...although development continued
 - Moreover, lessons learned from Vietnam and the 1973 Yom Kippur War, along with new SA-6 and SA-8 SAMs, convinced the Air Force that future attacks would occur from very low level which complicated guided weapon attacks using EO and laser-guided weapons
 - Spurred the development of low-level LGBs (Paveway IIIs)
- In the Navy:
 - Focus on anti-ship mission
 - Magazine limitations on carriers
 - Economic disincentive to jettison expensive guided munitions when returning to the carrier
- In both services:
 - Emphasis on the “smart plane-dumb bomb” model
 - Emphasis on platforms over munitions
 - Perception that air-to-ground guided munitions were more “silver bullets” than panacea
- On the positive side, both the Air Force and the Navy began to experiment with INS/GPS guidance
 - CALCM (USAF)
 - SIAM (USN)



Nevertheless, the ramifications of guided munitions warfare at the campaign level was being thoroughly examined

- 1978: Assault Breaker Program
 - Demonstrations in early 1980s confirmed the technical feasibility of wide-area Air Force sensors cueing **missile-delivered guided submunitions** against follow-on Soviet echelons
 - Became the basis for AirLand Battle and Follow-on Forces Attack
 - Also spurred the development of new ATGMs and artillery-delivered guided munitions
- Late 70s: US work spurred the Soviets to begin talking of a third Military Technical Revolution
 - First revolution: tank, aircraft, radio...leads to blitzkrieg and deep battle
 - Second revolution: atomic weapons
 - Third revolution: wide area sensors, guided munitions, automated C2
- By 1984, Marshal N.V. Ogarkov concluded that automated "reconnaissance-strike complexes" (RUKs) employing conventional guided munitions could achieve effects approaching that of nuclear weapons



Dragon, 1975



Hellfire, 1982

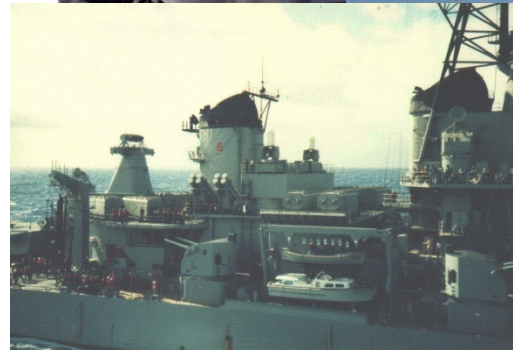


Copperhead, 1982



Meanwhile, the US Navy fully embraced the guided munitions revolution for war at sea

- US Navy carrier-centric tactical battle networks were faced by an increasingly capable Soviet operational battle network (a maritime “reconnaissance-strike complex”)
- In response: AEGIS; NTU, Mk-41 VLS; SM-2; LAMPS III; Mk-48 torpedo; CAPTOR
- Move towards all-digital combat systems
- New offensive weapons:
 - Harpoon ASCM (air, surface, subsurface launched)
 - Tomahawk (TASM; TASM) (surface and subsurface launched)
 - SLAM (air-launched)
- By the mid-1980s, surface warriors like Joe Metcalf and Wayne Meyer begin talking about an (offensive) “revolution at sea”

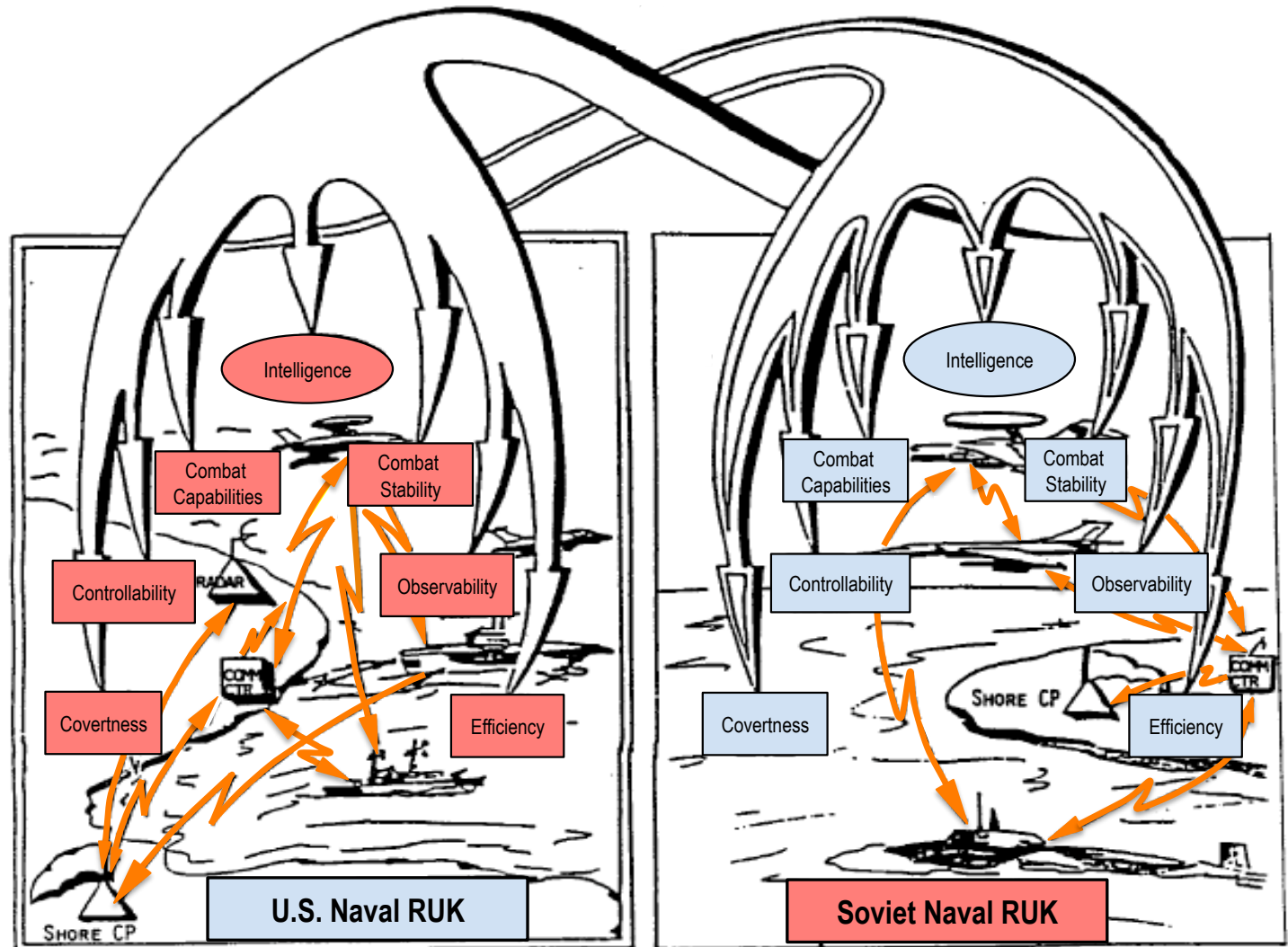




AirSea Battle (II): Late Cold War

- War against the Soviet Union would have seen the collision of two guided munitions battle networks (or recon-strike complexes, RUKs) at sea

Captain 1st Rank E. G. Shevelev, "Fundamentals and Applications of Military Systemology (Study Aid)," Foreign Broadcast Information Service, *JPRS Report: Central Eurasia*, JPRS-UMA-93-002-L, May 23, 1993





Defensive and offensive counter-air (including SEAD) also shifted over to guided munitions warfare

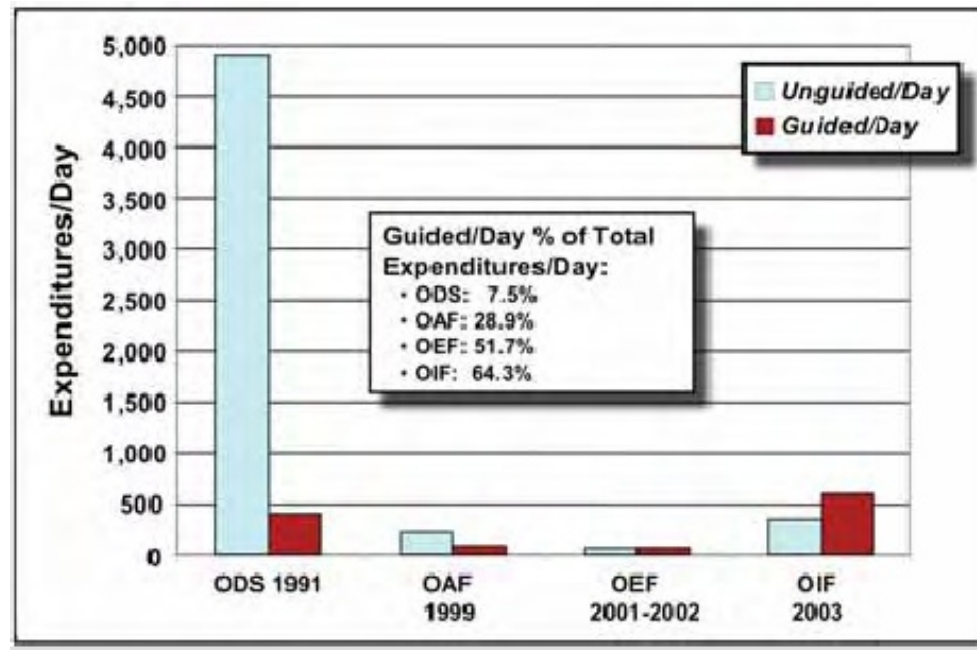
- US tactical air community studied the results of air operations against integrated air defense systems in Vietnam, the Yom Kippur War, and the 1982 Israeli attack against Syrian air defense systems in the Bekaa Valley
 - New SEAD techniques were developed for battle network v battle network combat
 - F-4G Wild Weasel
 - HARM
 - TALD
- At the same time, new air battle management aircraft, digital data links, and digital solid state air intercept missiles revolutionized air-to-air combat:
 - E-2C and AWACS
 - AIM-7M
 - AMRAAM





Desert Storm was the “defining battle” for guided munitions at the theater campaign level

- “The impact on the institutional US Air Force of the generally successful application of guided weapons during Desert Storm would be hard to overstate. In the aftermath of the campaign, TAC, along with the Air Force in general, made an institutional commitment to guided weapons...from which there has been no retreat. At the campaign level, perhaps the clearest evidence of this commitment can be seen in the dramatic reduction in the use of unguided munitions.”



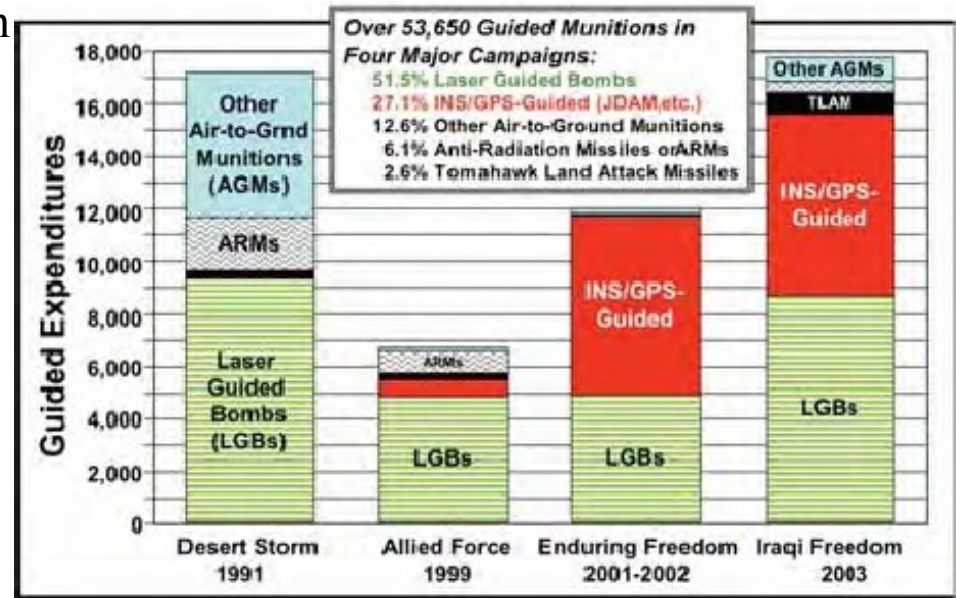
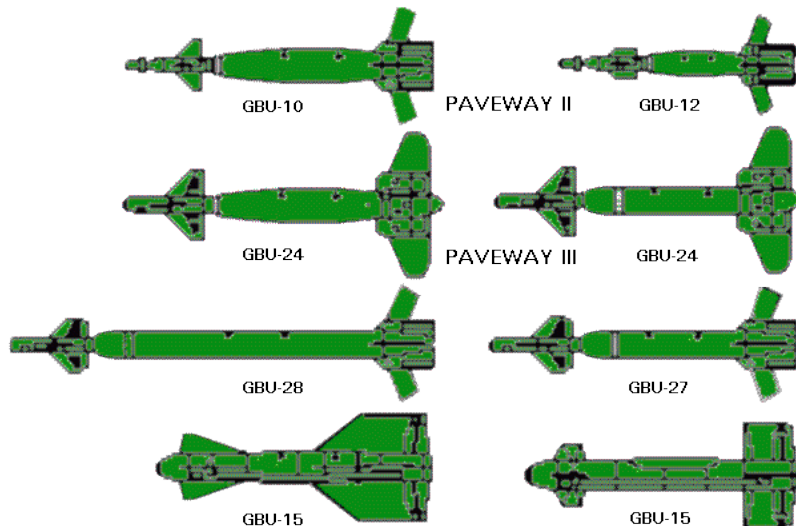
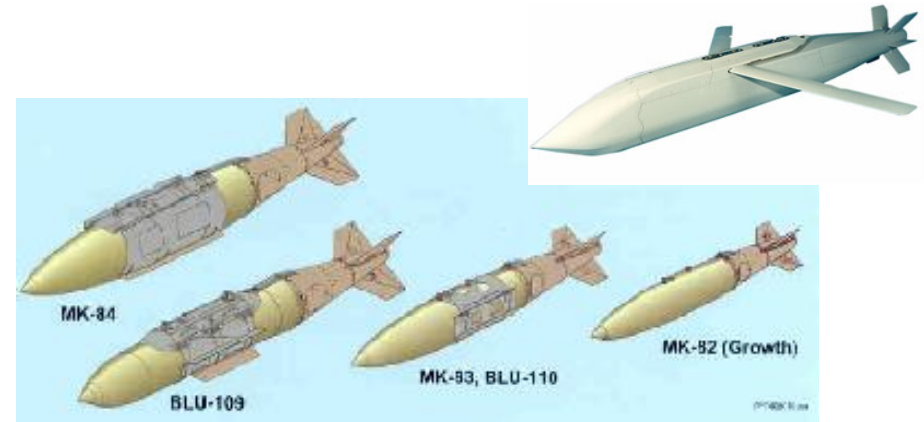
Barry Watts

Six Decades of Guided Munitions and
Battle Networks: Progress and
Prospects



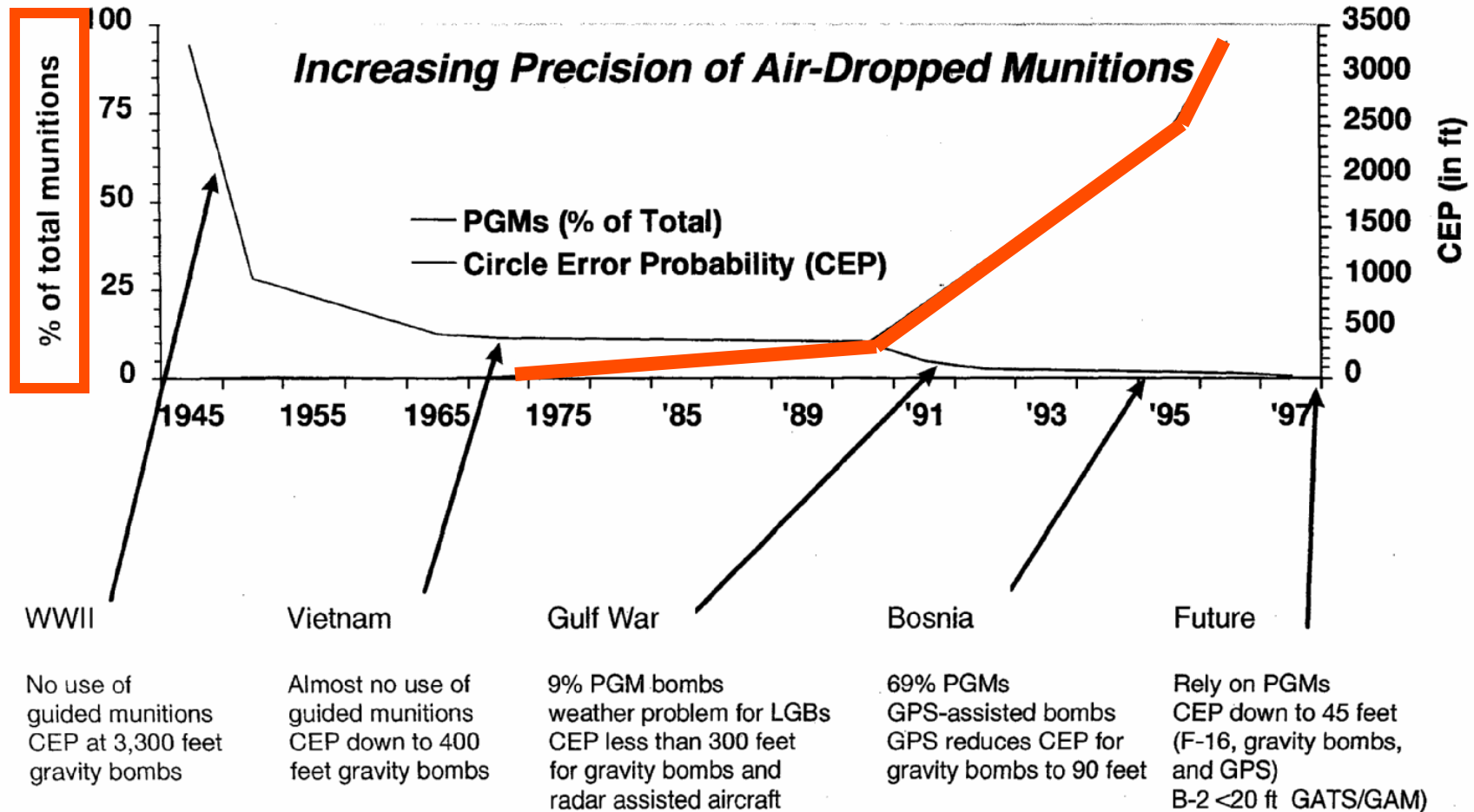
The guided munitions revolution accelerated with the appearance of cheap INS/GPS-guided munitions

- Weapons like the Joint Direct Attack Munition family of weapons and the Joint Stand-off Weapon allowed US joint forces to attack at night and through bad weather
 - Opened the way toward 24-hour, all-weather guided weapons bombardment
- Trend is to now blend laser and GPS guidance packages into the same munition





A revolution consummated: Guided Munitions Warfare





The guided munitions revolution proved to be very difficult to copy on the scale practiced by the U.S.

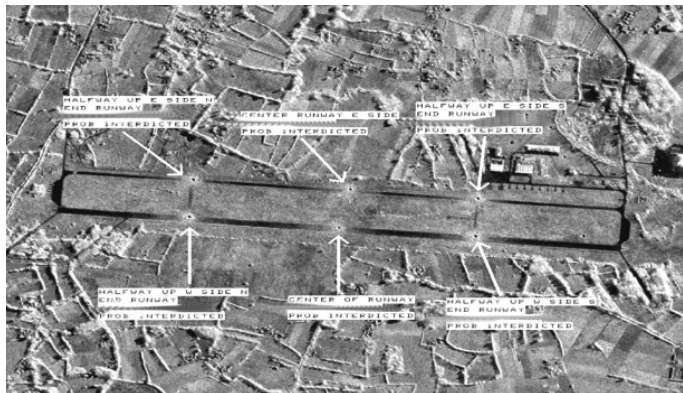
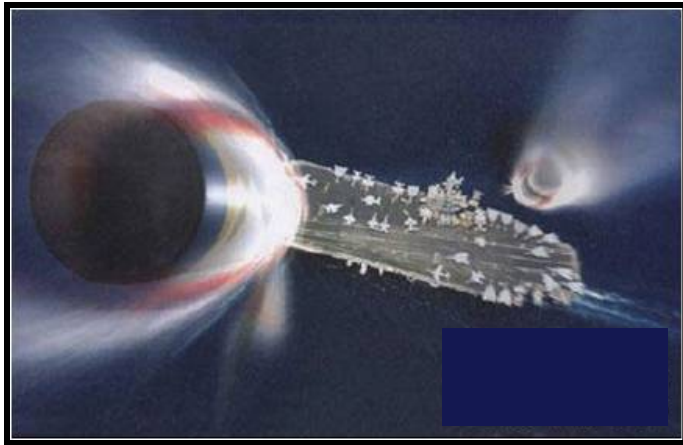
- Initial adversary efforts focused on disrupting US battle network operations
 - “Anti-scouting”
 - Decoys
 - Deception and denial (camouflage)
 - Obscurants
 - Laser dazzling
 - “Anti-C3”
 - Jamming
 - Counterforce (reduce effect of delivered firepower)
 - Dig, dig, dig
 - Shoot and scoot tactics
 - Hiding amongst the peoples
 - GPS jamming and spoofing
 - Active defenses
- At the same time, some regional powers pursued atomic weapons to deter the assembly of US multidimensional battle networks

“Nearly two decades after the Office of Net Assessment raised the issue of a revolution in military affairs based on precision munitions, advanced sensors, and more automated command and control, the United States is still the only power able to conduct information-enabled precision-strike on a global basis.”

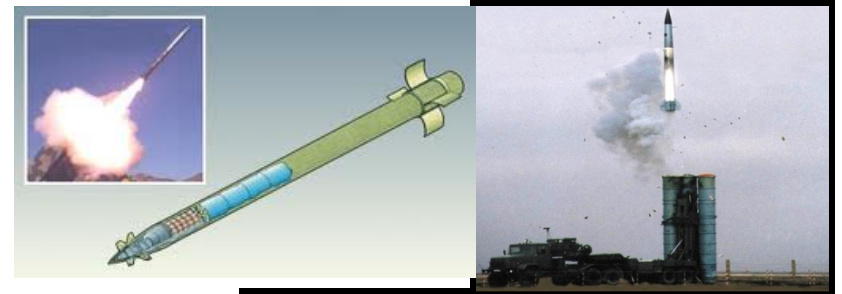
*Barry Watts
The Maturing Revolution in
Military Affairs*



Now, however, more competitors are beginning to compete (asymmetrically) in the guided munitions regime—both defensively and offensively



Anti-access (“A2”): prevent operational freedom of action



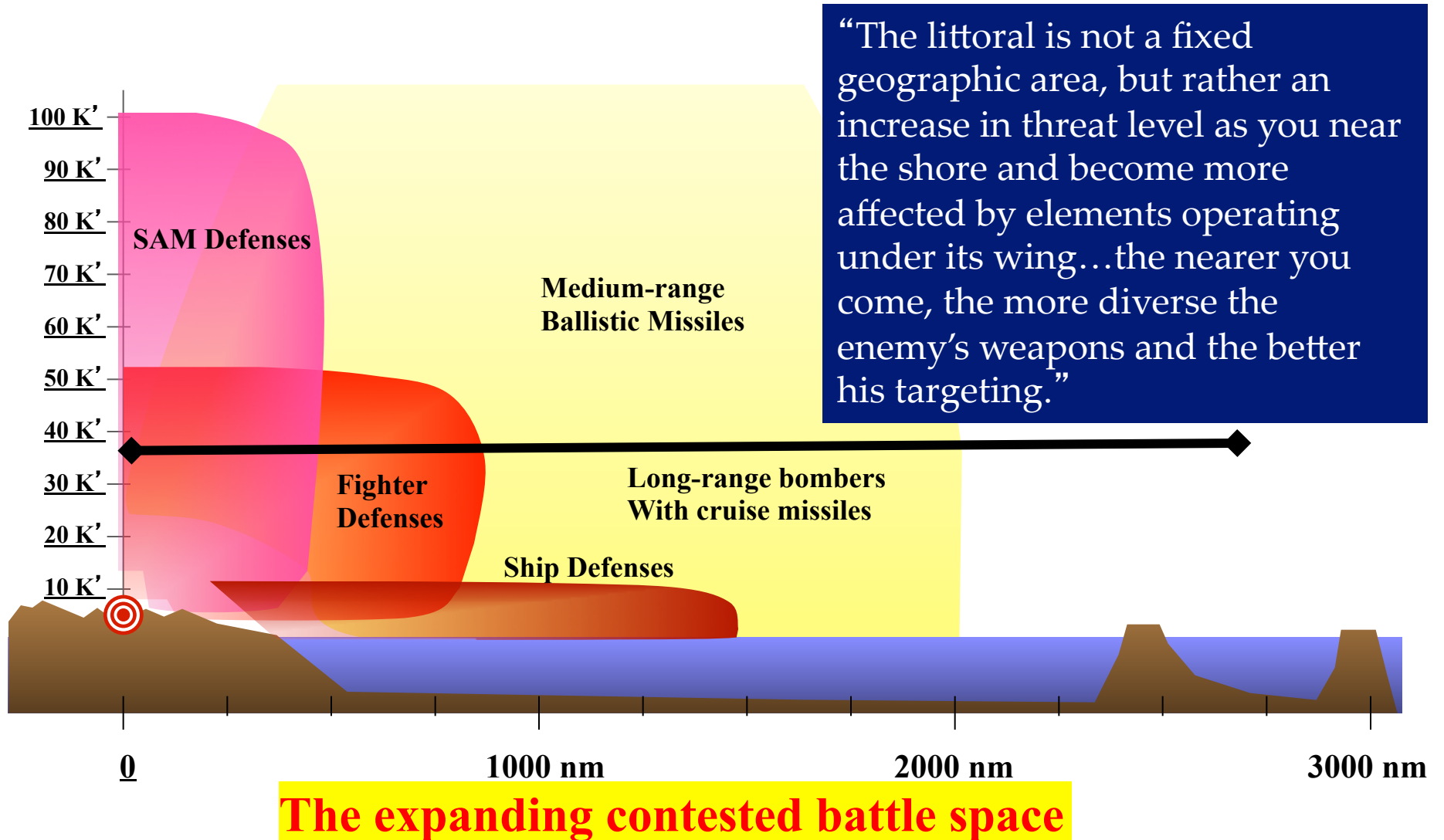
Most problematically for the US, guided weapons complicate getting joint forces into theater, and constrain their operations once there



Area-denial (“AD”): prevent tactical freedom of action



Modern “A2-AD” networks with guided weapons will greatly expand the contested zone that US joint forces will have to cross





AirSea Battle (III) is a new operational concept for fighting through A2-AD networks that employ guided munitions

- The ability to conduct operational maneuver from strategic distances—that is, the ability to project dominant military force across transoceanic ranges—underwrites US conventional deterrence
- The appearance of integrated A2-AD networks at bay as well as the proliferation of guided rockets, artillery, mortars, and missiles (G-RAMM) will make future US power-projection operations more difficult
- AirSea Battle will enable future US transoceanic and inter/intra-theater power projection operations against opponents with capable A2-AD networks that employ guided munitions
 - AirSea Battle will soon be a necessary precursor before deploying the remainder of the joint force
 - AirSea Battle will naturally transition to AirLand Battle (II), updated to account for operations on battlefields swept by enemy G-RAMM



At its core, AirSea Battle (III) is about winning a guided munitions salvo competition

- Key aim: to disrupt and destroy enemy A2-AD networks and offensive guided systems in order to enable US freedom of action to conduct concurrent and follow-on operations. ASB does this by winning a two-sided force and counter-force competition:
 - FORCE/SCOUTING/C3I: Effectively attacking/disrupting/destroying the enemy's A2/AD network (force) by:
 - "Scouting" the enemy's battle network
 - "Attacking effectively first"
 - Coordinating operations and salvos using widely dispersed forces
 - Sustaining effective salvos
 - Using both kinetic and non-kinetic means



Attacking the enemy's network is only one side of the salvo competition...

- COUNTERFORCE/ANTI-SCOUTING/ANTI-C3I: Capacity to reduce the effect of enemy-delivered firepower, by:
 - *Reducing the total number of effective enemy guided munitions salvos*
 - “Scouting” the enemy’s network
 - Blinding, disrupting, destroy the opposing battle network
 - “Anti-scouting” activities to prevent targeting
 - *Reducing the potential density of effective enemy guided munition salvos*
 - “Scouting” for guided munitions delivery systems
 - Eliminating as many guided weapon systems as possible: Killing the archers
 - *Riding out actual enemy salvos*
 - Passive defenses (spoofing, deception, etc)
 - Active defenses



Other key considerations

- Posturing for effective operations
 - Solving the basing asymmetry problem
 - Base hardening, dispersion, etc.
 - Building stealthy and long-range or long-endurance strike forces (e.g., bombers, SSGNs)
 - Designing operations to account for salvo density rings
- Preparing to fight through a first (surprise?) salvo
 - US forces may have to take a first salvo before launching their first attacks
 - Violates the key principle of “Attack effectively first”
 - I&W becomes critical
- Sustaining ability to launch salvos
 - Depth of magazine
 - Reload capabilities
 - Battle network “train”
- Preparing for technical and tactical surprises
 - Some weapons and tactics will be more effective than planned; some not as effective as planned



AirSea Battle (III) will require new levels of joint integration between the Navy and Air Force

- Like AirLand Battle before it, AirSea Battle (III) sees the solution primarily in terms of joint operations—in this case involving naval and aerospace forces
- AirSea Battle (III) builds upon the successful partnerships and integrated operations between the Navy and Air Force during AirSea Battle II, Desert Storm, OAF, OEF, and OIF
- Successful demonstrations of AirSea Battle (III) in exercises and field tests will:
 - Strengthen US conventional deterrence;
 - Reassure allies; and
 - Improve regional crisis stability





Summary

- AirSea Battle (III) is a new joint operational concept about projecting power against an opponent with rough guided munitions and battle network parity that will:
 - Underwrite US power-projection capabilities
 - Reassure allies
 - Improve regional crisis stability
- AirSea Battle focuses on winning a two-sided guided munitions salvo competition in order to facilitate concurrent and follow-on operations
 - Much more than just kinetic attack
 - Force and counterforce
 - Scouting and anti-scouting
 - C3 and anti-C3
- Will lead to new Navy-Air Force tactics, techniques, and procedures in the near term, and new platforms, sensors, and weapons in the future



Questions?