

CSBA



Naval Aviation and Long-Range Strike: Coming Choices

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Generating Combat Power at a Distance Will Be the *Sine Qua Non* of the Joint Expeditionary Era

- **The whole power of the United States, to manifest itself, depends on the power to move ships and aircraft across the sea.** Their mighty power is restricted; it is restricted by the very oceans which have protected them; **the oceans which were their shield, have now become both threatening and a bar, a prison house through which they must struggle to bring armies, fleets, and air forces to bear upon the common problems we have to face.**

Winston Churchill, 1942

- One characteristic of the system is that it has hugely increased the economic interdependence and drastically reduced the importance of geographic distance—so that what happens “over there” matters far more to us “here” than it once did. **Hence, navies are being required to act together in common cause to project military powers ashore, particularly in *expeditionary operations* at a distance from the home base.**

Geoffrey Till, 2005

- **The armed forces of the future will have to concentrate on *high-quality units* suited for *expeditionary operations* along with the *armed forces of other countries*, meaning carrying out military operations **at relatively large distances from the home base with a logistically, largely self-sufficient armed force.****

Captain (RNLN) Henk M.H. Satjin, 2005

Aircraft Carriers Thus Will Continue to Play an Important Role in the Joint Expeditionary Era

- ...naval forces are able, without resorting to diplomatic channels, to establish off-shore, anywhere in the world, airfields completely equipped with machine shops, ammunition dumps, tank farms, warehouses, together with quarters and all types of accommodations for personnel. Such task forces are virtually as complete as any air base ever established. **They constitute the only air bases that can be made available near enemy territory without assault or conquest,** and furthermore, they are mobile offensive bases that can be employed with the unique attribute of secrecy and surprise, which contributes equally to their defensive as well as offensive effectiveness.

Admiral Chester Nimitz, 1945

- **As *Operation Enduring Freedom* demonstrated, the combination of carrier tactical aviation with long-range bombers provides the US with aviation strike forces with impressive global freedom of action**
 - Naval tac-air, operating from carriers, provided nearly 75 percent of the sorties
 - Long-range bombers delivered 70 per cent of tonnage
 - Both tactical and bomber aircraft were empowered by the widespread use of guided weapons
 - 60 percent of all weapons dropped were guided munitions

Over the Past 15 years, Carrier Air Wings Have Substantially Improved Their Ability to Strike Targets From the Sea

- **1989:**
 - 36 Strike aircraft per wing (A-7, A-6)
 - 162 sorties per day, max surge
 - One target per sortie
 - Assuming a 200-nm range to target (no refueling) and good weather, a CAW could strike 162 aimpoints in a single day
- **2005:**
 - 44 Strike aircraft per wing (F/A-18C)
 - 207 sorties per day, max surge
 - Three to four targets per sortie
 - Assuming a 200-nm range to target (no refueling) and good weather, a CAW can strike 693 aimpoints in a single day
- ***However, the CAW's ability to operate at range has improved only modestly***

Source: *CVW Strike Sortie/Aimpoint Improvement*, unclassified point paper (Washington, DC: DoN (N8QDR), January 18, 2001)

The Ongoing Introduction of the F-18E/F and EA-18G Continues the Improvement of CAW Capabilities

- “2010 Air Wing”:
 - One 12-plane Navy F/A-18E squadron
 - One 12-plane Navy F/A-18F squadron
 - One 10-plane Navy F/A-18C squadron
 - One 10-plane Navy/Marine F/A-18C squadron
 - Five E/A-18G *Growlers* or E/A-6B *Prowlers*
 - All aircraft capable of dropping guided weapons, giving the CAW 44 “strikers” each capable of carrying 4-6 PGMs (more when SDB is introduced)
 - Assuming a 200-nm range to target (no refueling) and good weather, the 2010 CAW should be able to strike 1,080 aimpoints in a single day

- The E/F improves CAW range:
 - When carrying four 2,000-pound bombs and two AIM-9 Sidewinders, the F-18E/F has a combat radius of 520 nm unrefueled, compared to 341nm for the F-18C (Source: Jane’s Defense Weekly)

- Block II E/F (with AESA Radar) also improves CAW aircraft survivability and effectiveness

– Block II F/A-18E/F:	.650	Relative aircraft effectiveness scores Source: GAO, <i>Department of the Navy’s Tactical Aviation Plan is Reasonable, But Some Factors Could Affect Implementation</i>
– Block I F/A-18E/F:	.316	
– F/A-18C/D:	.193	

The Navy Will Soon Begin Recapitalizing its Carrier Fleet, Resulting in Dramatic Improvements to Naval Aviation “Sea Bases”

CVN-21

Enhanced Ship Self Defense

Evolved Sea Sparrow Missile

Improved Weapon & Material Handling

Outboard Weapons Elevators

Heavy Underway Replenishment

Double Height Magazines & Storerooms

Integrated Island

Composite Mast

Smaller Island Re-Positioned Aft & Outboard

MFR/VSR Radars

Joint Precision Approach and Landing System

Advanced Arresting Gear

Improved Survivability

Underwater Protection

Zonal Electrical Distribution System

New Propulsion Plants

New Propulsion/Electric Plant

All Electric Aux Services

Hangar Bays (2)

4 ElectroMagnetic Aircraft Launching Systems (EMALS)
Advanced Jet Blast Deflectors

Aircraft Elevators (3)

Enhanced Flight Deck

Enlarged Flight Deck Footprint "Pit Stop"

- Improved sortie generation
- Improved survivability and self-defense
- Reduced life-cycle costs

Despite Advancements to Date, Additional Improvements to Carrier Aviation's **Reach, Persistence, and Stealth** are Needed

- Future challenges highlighted by the 2005 QDR put a great premium on range, stealth, and persistence
 - Rising China
 - Counter-proliferation operations
 - Counter-terrorism operations
 - Counter-sanctuary operations
 - Failed nuclear states
- It is the combination of all three characteristics that provides a force with the greatest payoff:
 - Range: strikes against targets in denied areas; operating outside anti-access/area-denial (A2/AD) rings
 - Stealth: unwarned strike; strike deniability; operations inside A2/AD rings
 - Persistence: improved ISR; time critical strikes; mobile targets

Reach—the Combination of Range and Persistence—is Especially Important in the Pacific Theater of Operations

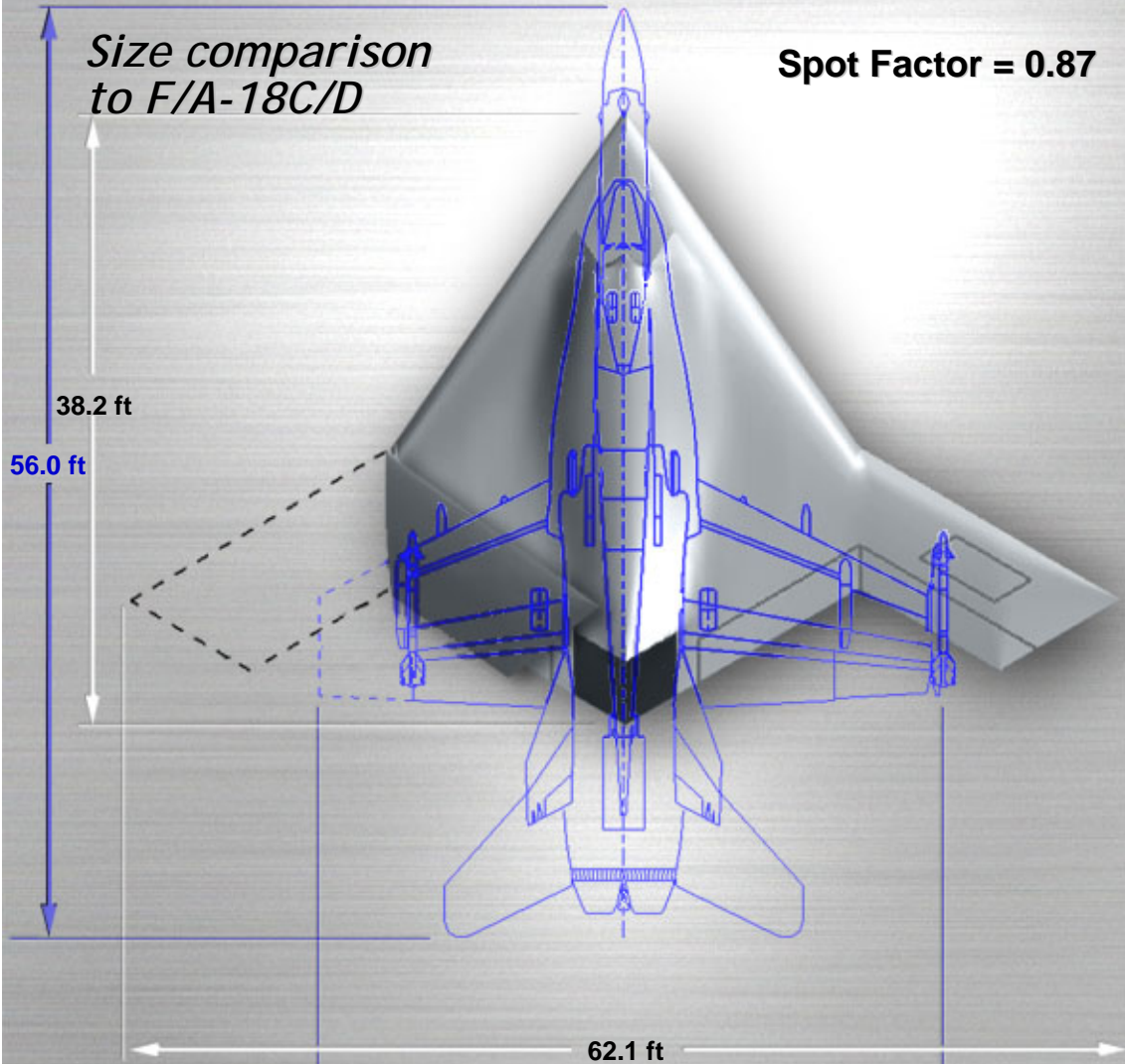


One Pathway to Improve CAW **Range and Stealth** is to Pursue the Carrier Version of the Joint Strike Fighter



- Based on its expected performance, the F-35C CV version of the JSF has a relative effectiveness score of 1.000, five times that of a F-18C, three times that of a Block I F-18E/F, and 35 percent greater than a Block II E/F
 - Maximum unrefueled range (full stealth) is expected to be approximately 700 miles
- “Naval Vision 2020” sees a CAW with 24 F-18E/Fs and 20 JSFs
 - A future CAW armed with JSFs, F/A-18E/Fs, and E/A-18Gs will be able to deliver more strike payload from 450 nautical miles than an F-18C-equipped air wing can deliver at 250 miles, and be able to sustain combat air patrols farther, and for longer periods, from the carrier (Source: Center for Naval Analysis)

A Second Pathway is to Pursue a Refuelable CV-UCAS, Which Provides **Range, Stealth, and Persistence**



X-47B Demonstrator Air Vehicle*:

- Altitude: >40,000 ft
- Speed: High Subsonic
- Payload: >4,000 lb
- Unrefueled range (w/max payload): >3,000NM
- Sensor Provisions: EO/IR/Radar/ESM
- Air refueling provisions: USAF & USN
- Mission TOGW: >45,000 lbs
- Basing: Land and CV

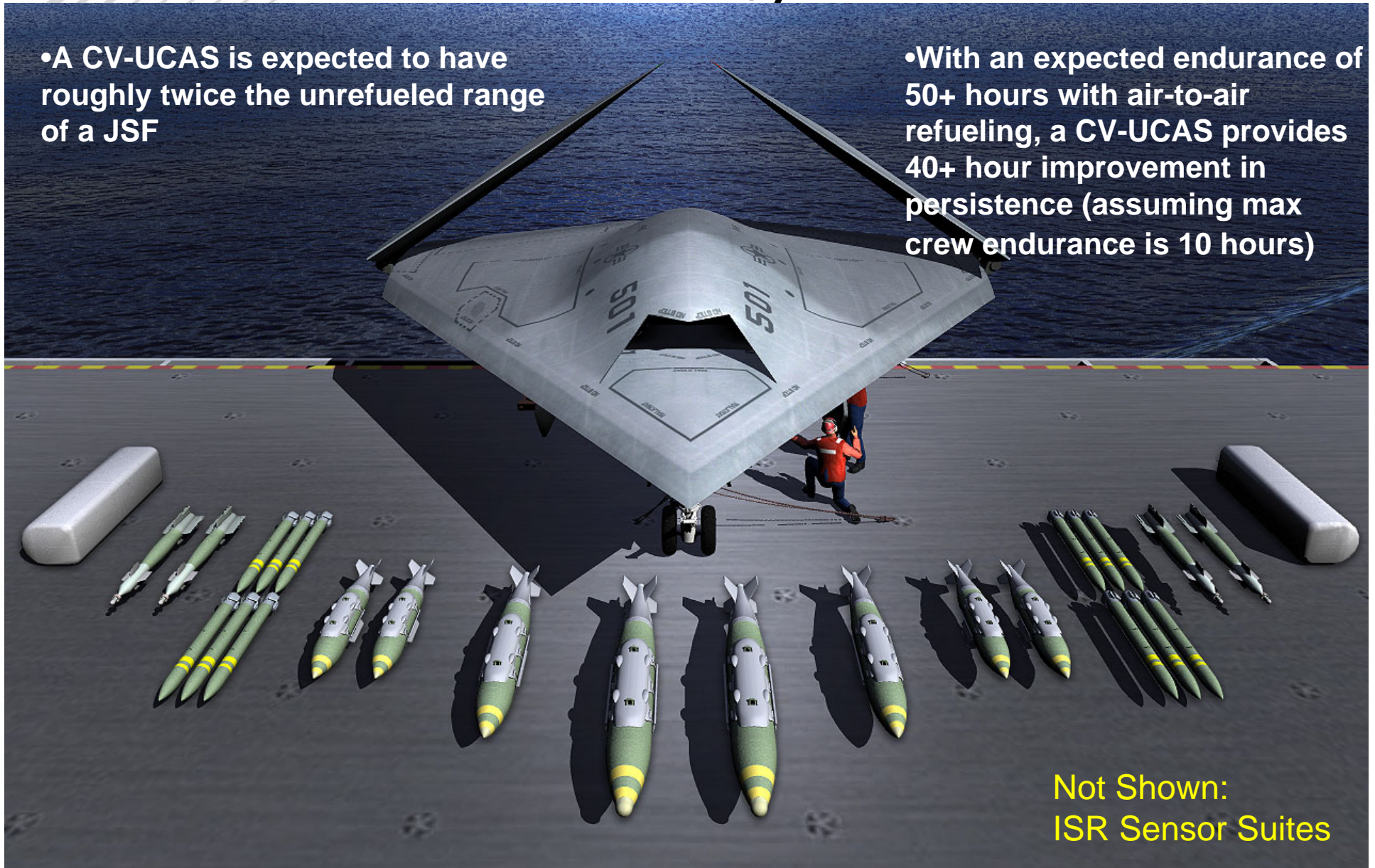


* Note that these are the performance parameters of a demonstration aircraft; performance for a production CV-UCAS performance could be much improved

A Refuelable CV-UCAS is Best Thought of as a Long-Range, Stealthy, Modular, ISR-Strike System

- A CV-UCAS is expected to have roughly twice the unrefueled range of a JSF

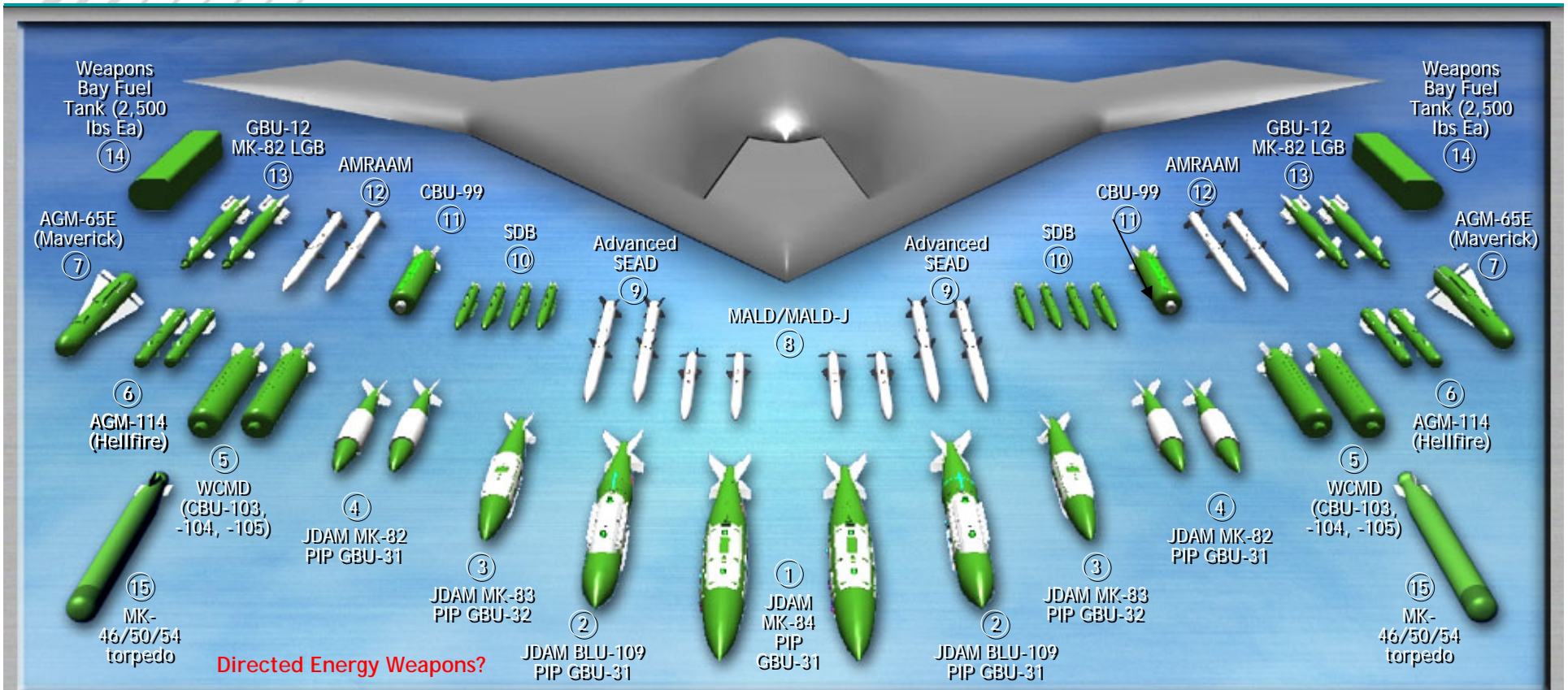
- With an expected endurance of 50+ hours with air-to-air refueling, a CV-UCAS provides 40+ hour improvement in persistence (assuming max crew endurance is 10 hours)



Not Shown:
ISR Sensor Suites

No Reason Why a CV-UCAS Could Not Be Further Modified to Carry an Even Greater Array of Weapons

Illustrative Weapon Carriage Potential—4500lb Payload



No.	Weapon	Qty
1	JDAM MK-84 PIP GBU-31	2
2	JDAM BLU-109 PIP GBU-31	2
3	JDAM MK-83 PIP GBU-32	2
4	JDAM MK-82 PIP GBU-31	4
5	WCMD (CBU-103, -104, -105)	4

No.	Weapon	Qty
6	AGM-114 (Hellfire)	4
7	AGM-65E (Maverick)	2
8	MALD/MALD-J	4
9	Advanced SEAD	4
10	Small Diameter Bomb	12

No.	Weapon	Qty
11	CBU-99	2
12	AMRAAM	4
13	GBU-12 MK-82 LGB	4
14	Wpns Bay Fuel Tank	1-2
15	MK 46/50/54 torpedo	2

**Programmed weapons in purple*

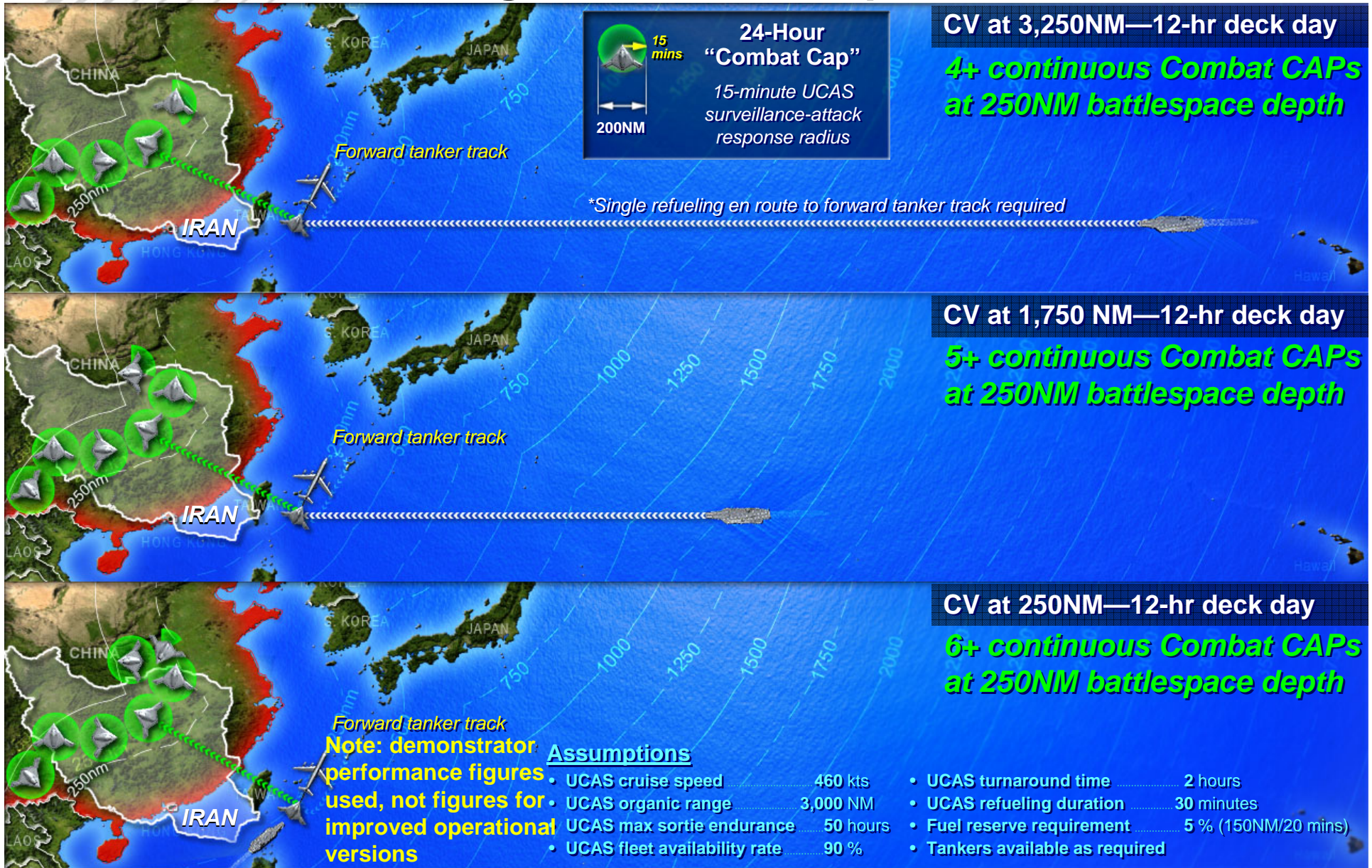
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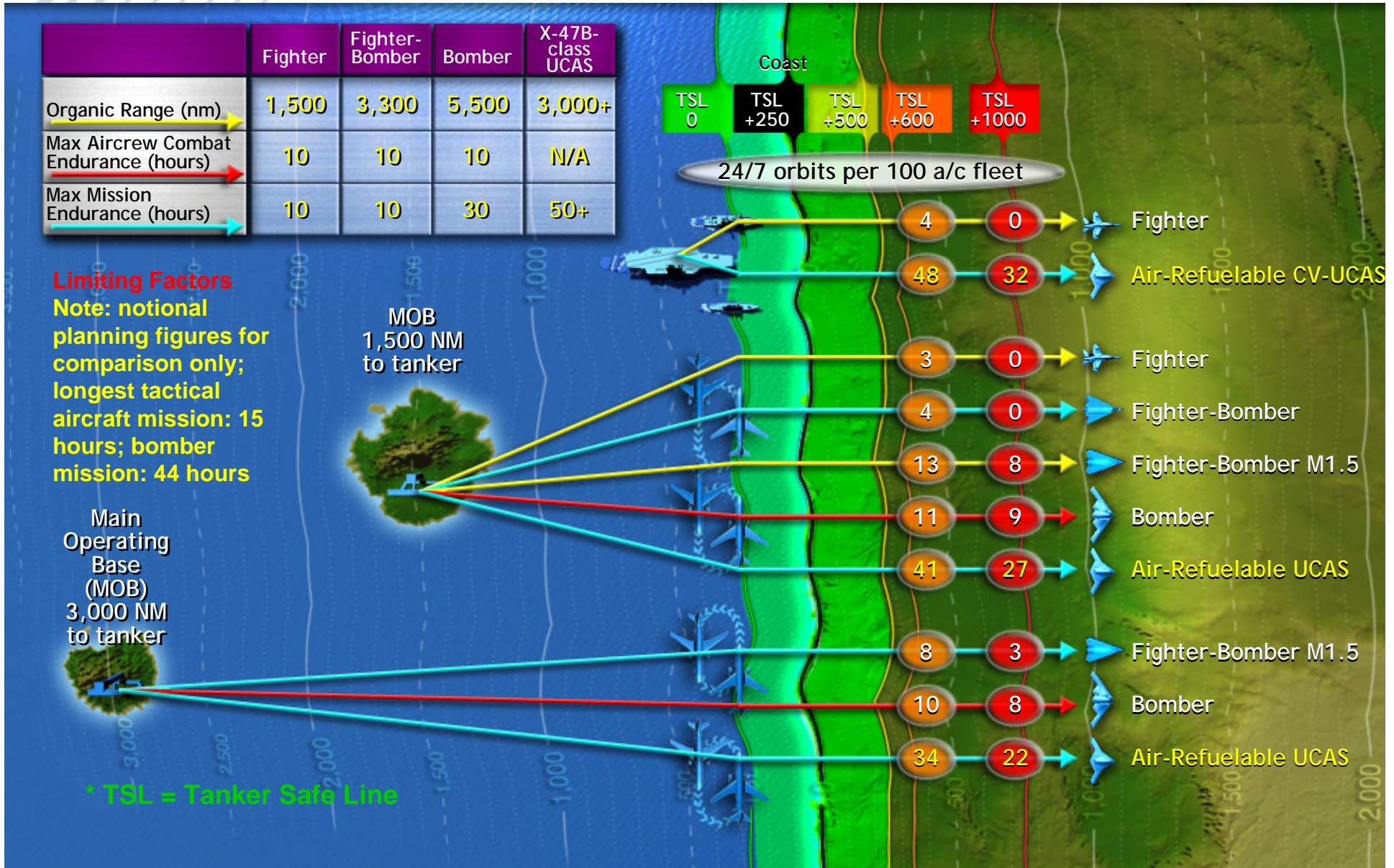
Key Question: What Is the Proper Number of CV-UCASs For Each Future Carrier Air Wing?

- **“Naval Vision 2020” sees one 4-12 plane CV-UCAS squadron per carrier**
- **Recent war games have confronted participants with a “Near Peer Competitor” with robust military capabilities:**
 - **Anti-access/area-denial (A2/AD) network including submarines, mines, anti-ship cruise missiles and anti-ship ballistic missiles with maneuvering RVs**
 - **Maritime and aerospace approach surveillance network**
 - **Extensive ballistic missile and theater air attack forces**
 - **Regional air dominance forces**
 - **Sea denial capabilities**
- **Under these stressing circumstances, war game participants are generally unwilling to risk the loss of an aircraft carrier carrying 4,000 to 5,000 personnel and 75+ aircraft, especially if the adversary is armed with maneuvering anti-ship ballistic missiles**
- **Generally, participants opt to stand outside the range ring (1,600 nm) until the adversary’s OTH targeting network is destroyed**

One 12-Plane CV-UCAS Squadron Will Provide a Carrier Air Wing With Impressive Stand-off Range and/or Battlespace Persistence



Once the Maritime A2/AD Network is Rolled Back, CV-UCAS Will Provide Persistent Inland Coverage



Wargame Results Suggest a 12-Plane CV-UCAS Squadron Should Be the *Minimum* Planning Target for Future CAWs

- For scenarios against capable A2/AD networks in the Pacific, players have generally opted to fly off F-18s and JSFs and load up the carrier deck with CV-UCASs
 - Players often retain the F-18F squadron for Fleet Air Defense
 - The unique shape of the CV-UCAS allows for dense deck loading
 - Imagine a World War II *Essex*-carrier size load-out of 12 F-18Fs and 72-84 CV-UCAS (six or seven 12-plane squadrons)
 - Formidable stand-off range and persistence
- CV-UCAS modularity provides great flexibility:
 - For extended-range anti-invasion missions, players loaded the CV-UCAS with LOCASSs
 - For extended-range air dominance missions, players loaded the CV-UCAS with AMRAAMs (remote AAW magazine)
 - For extended-range ISR missions, players loaded the CV-UCAS with a variety of sensors
 - For extended range strike, players loaded UCAS with a variety of munitions

It is Important that the DoN Pursue the Promise of CV-UCAS

- In terms of range, stealth, and persistence, a CV-UCAS **likely will provide the greatest payoff for future Naval Aviation**
- It is therefore important to continue the J-UCAS demonstration program concurrently with the development of the Joint Strike Fighter. The current program aims to demonstrate in 2009-11:
 - Carrier suitability
 - Aerial refueling
 - Formation flying
 - Command and control
 - Weapons separation and stealth
- Based on the results of this demonstration, as well as the results of the JSF development program, the 2020 CAW mix should be reexamined
- A subject for the 2013 QDR
 - Don't foreclose options in the interim!