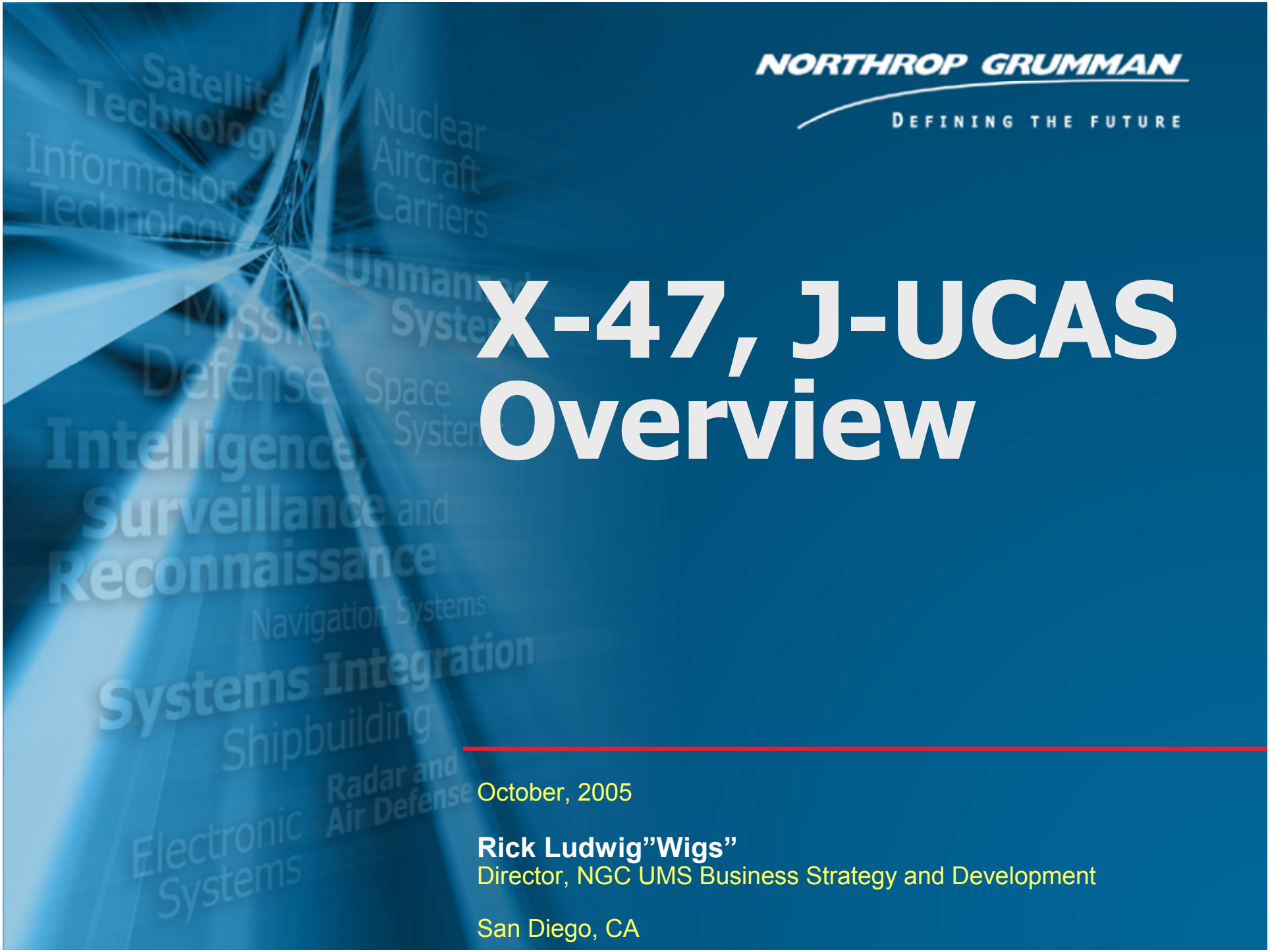

X-47, J-UCAS Overview

October, 2005

Rick Ludwig"Wigs"
Director, NGC UMS Business Strategy and Development

San Diego, CA

Why X-47, J-UCAS?

- **The Advantages Are Straightforward :**
  - Relief From Human Endurance Constraints : Step-Function Increase in Battlespace Persistence
    - Persistence : The Critical Attribute for Future Surveillance & Attack Systems
  - Strong Cost-Effectiveness Advantages
    - Enables Persistent Broad-area Coverage With Greatly Reduced Force Sizes
    - Significant Training and Operational Cost Savings
  - Relief From Human Mortality Constraints
    - Provides Greater Operating Freedom in Projected Threat Environments
    - Higher Perceived Usability Enhances Deterrent Effect of US Forces

J-UCAS Offers Survivable, Affordable, Joint, Theater-Wide Persistent Surveillance-Attack

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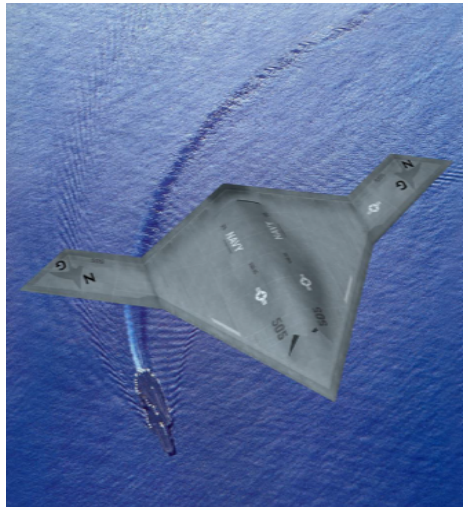
DARPA J-UCAS Program in Perspective

- **Not an acquisition program…yet**
- **Rather, a <u>demonstration</u> program designed to:**
  - Reduce technical risk
    - Prove feasibility of UCAS concept
    - Match manned systems' reliability, dynamic ops capability
  - *Examine the UCAS concept transformational utility through analysis & live/virtual operational assessment*
  - Develop future UCAS acquisition options, quantifying appropriate system attributes (range, payload, speed, stealth, mission systems)
- **While J-UCAS demonstration systems will yield initial military capability, the operational systems are in development**
- **NGC involved because of potential to provide major new transformational capabilities**



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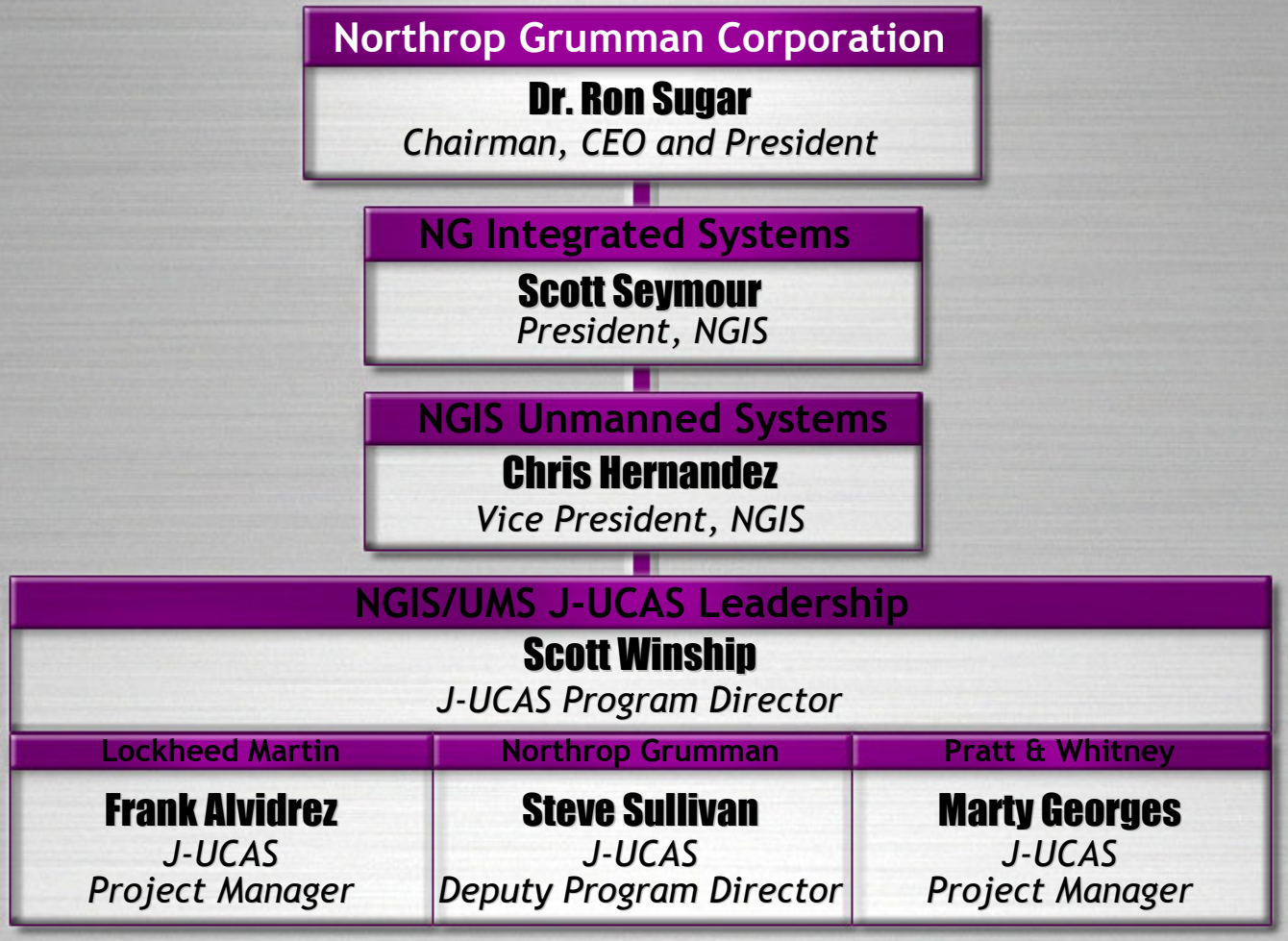
NGC J-UCAS Program Organization



The NGC J-UCAS Team Legacy

Carrier/Fleet Operations

UAV Development, Integration and Operations

Combat Aircraft Design, Manufacturing and Operations

Network Centric Ops and Common Systems

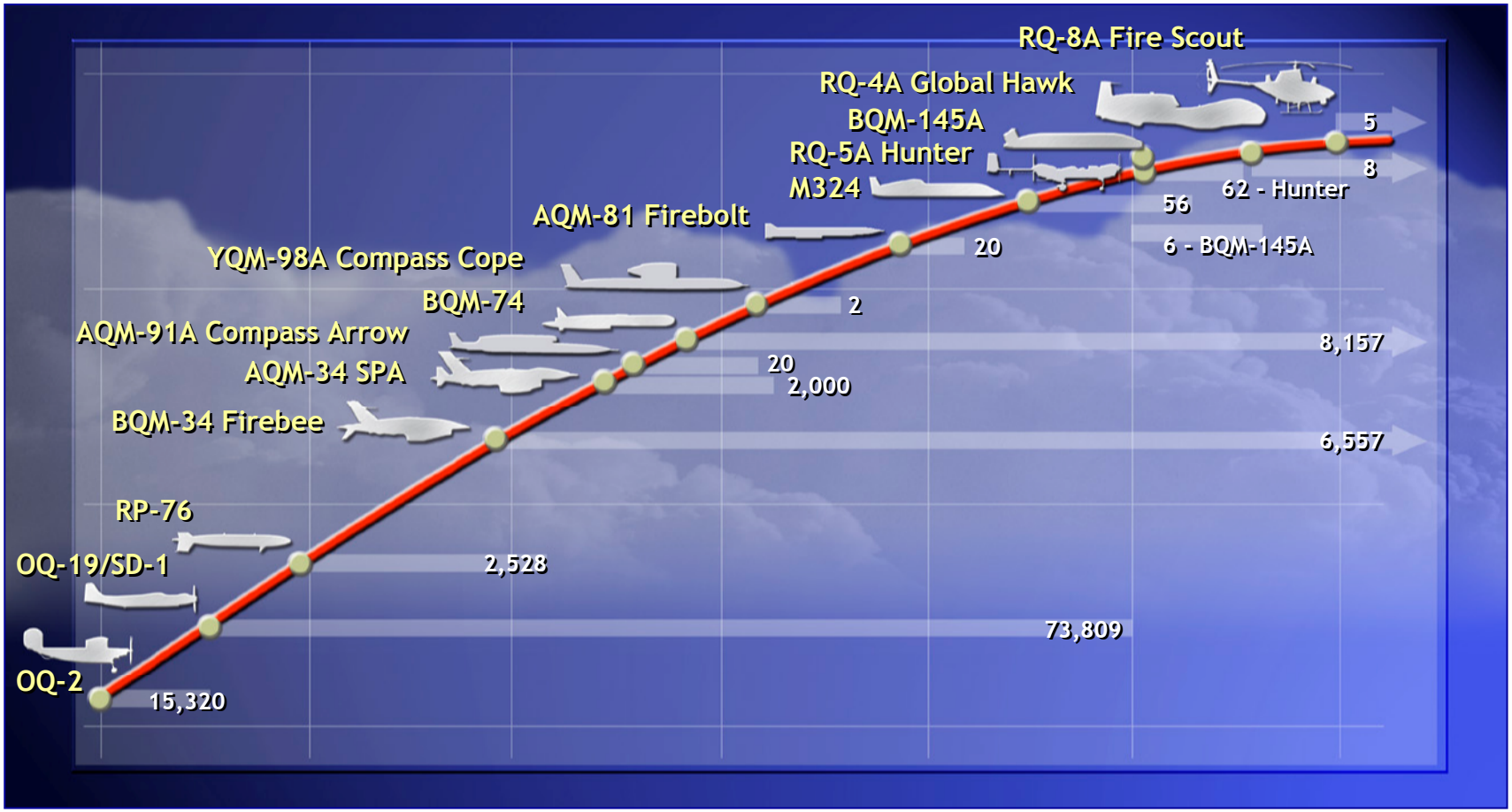
Low Observables

SEAD and EA Systems and Operations

Air-Surface ISR Systems and Operations

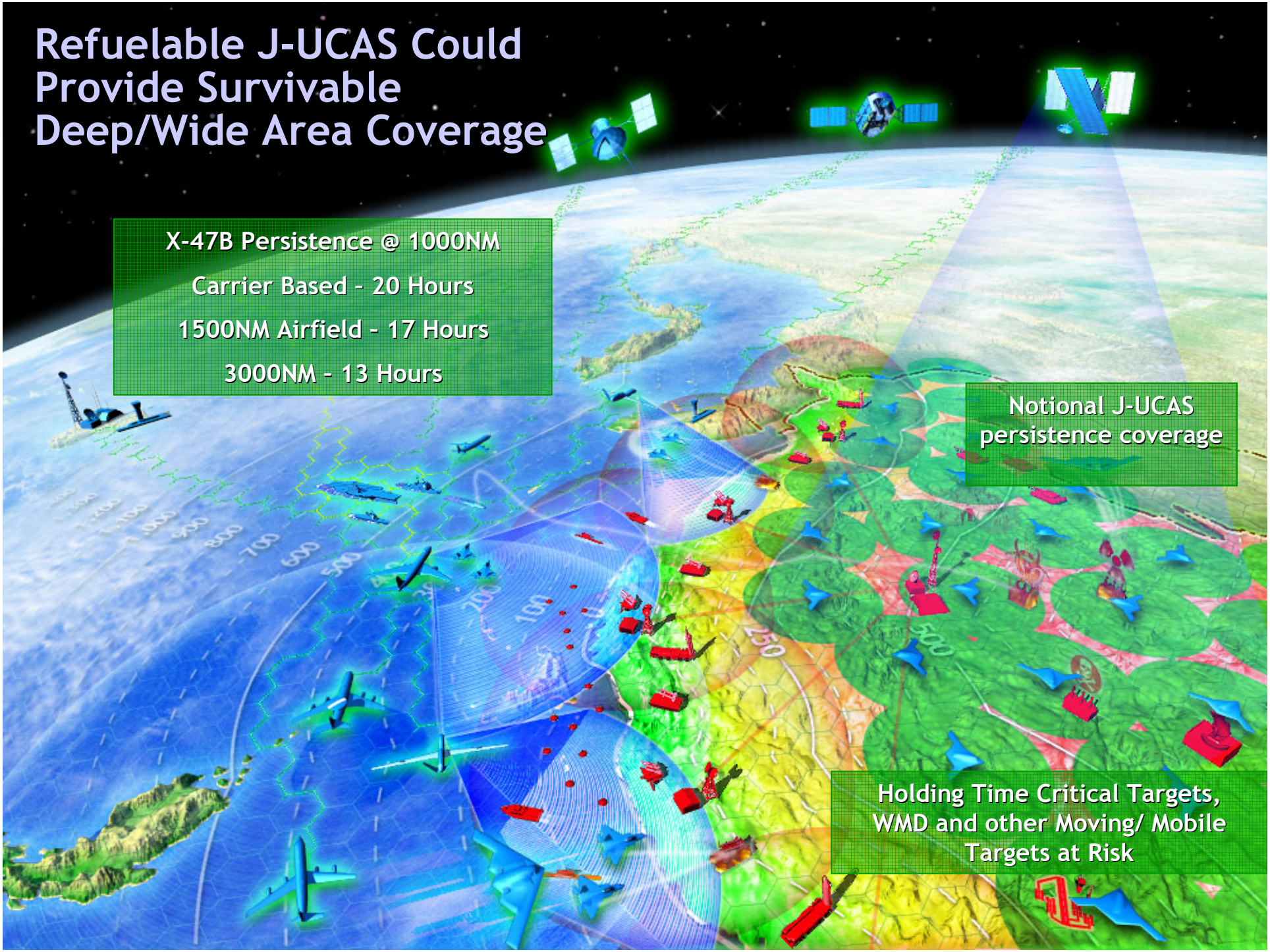
>100K UAVs Delivered Since 1940

Total NGC UAVs Delivered By Type/Timeframe

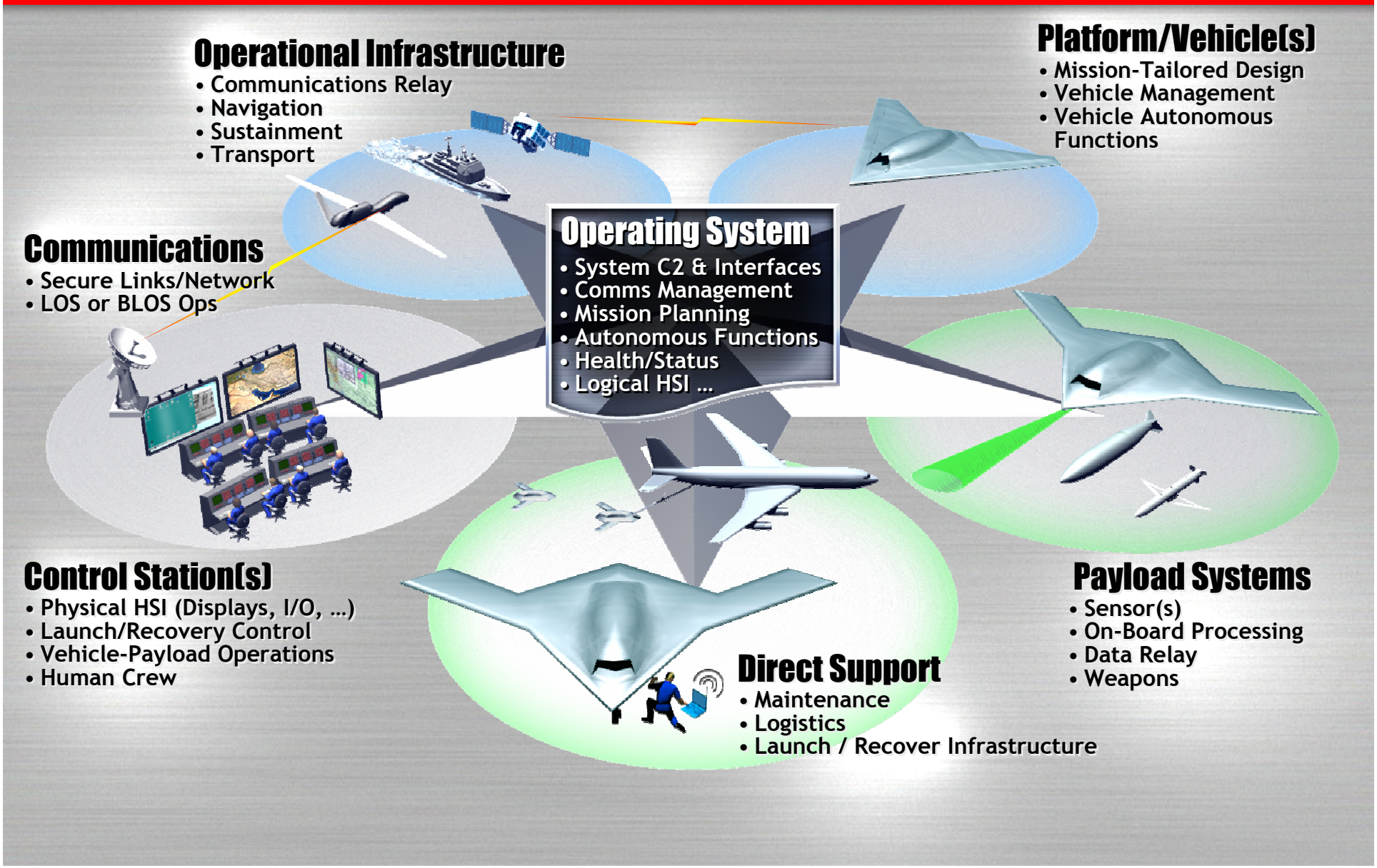


NORTHROP GRUMMAN

Refuelable J-UCAS Could Provide Survivable Deep/Wide Area Coverage

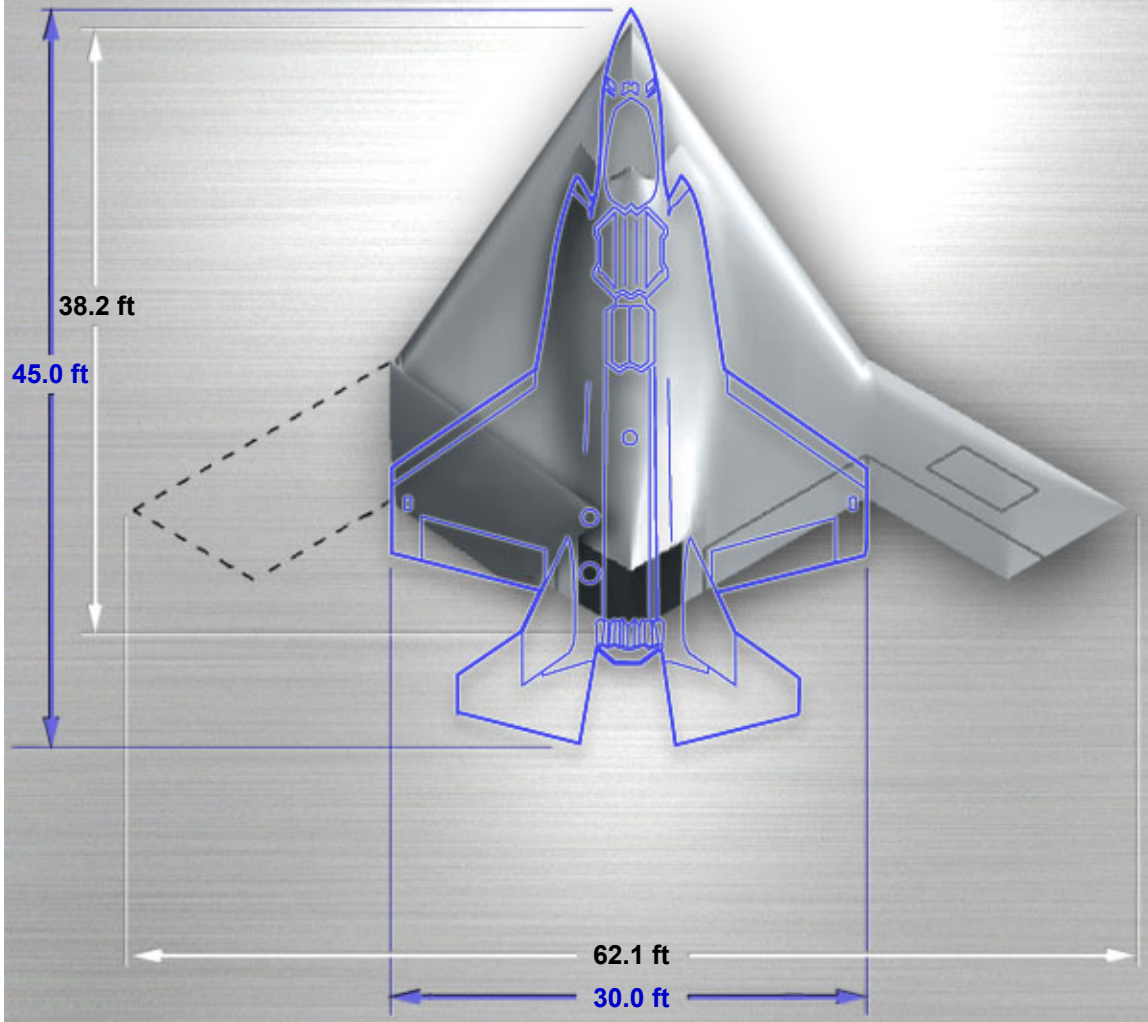


J-UCAS Program/System Elements



X-47B Air Vehicle

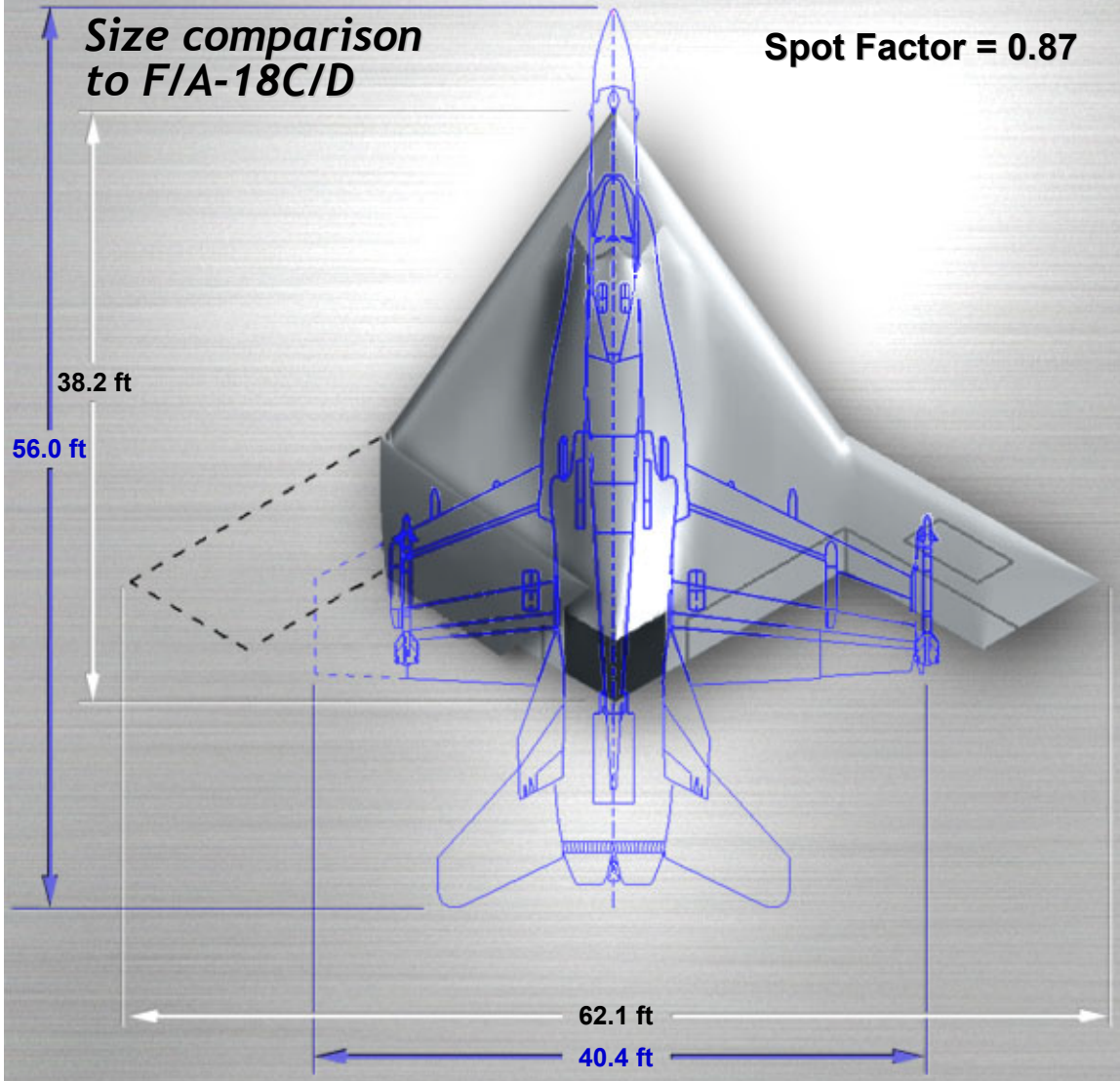
Size comparison to USAF F-35



J-UCAS X-47B Air Vehicle

- **Altitude:** >40,000 ft
- **Speed:** High Subsonic
- **Payload:** >4,000 lb
- **Unrefueled range (w/max pyld):** >3,500NM
- **Sensor Provisions:** EO/IR/SAR/ GMTI/ESM
- **Air refueling provisions:** USAF style
- **Mission TOGW:** >45,000 lbs
- **Basing:** Land & CV

X-47B J-UCAS Demonstration System



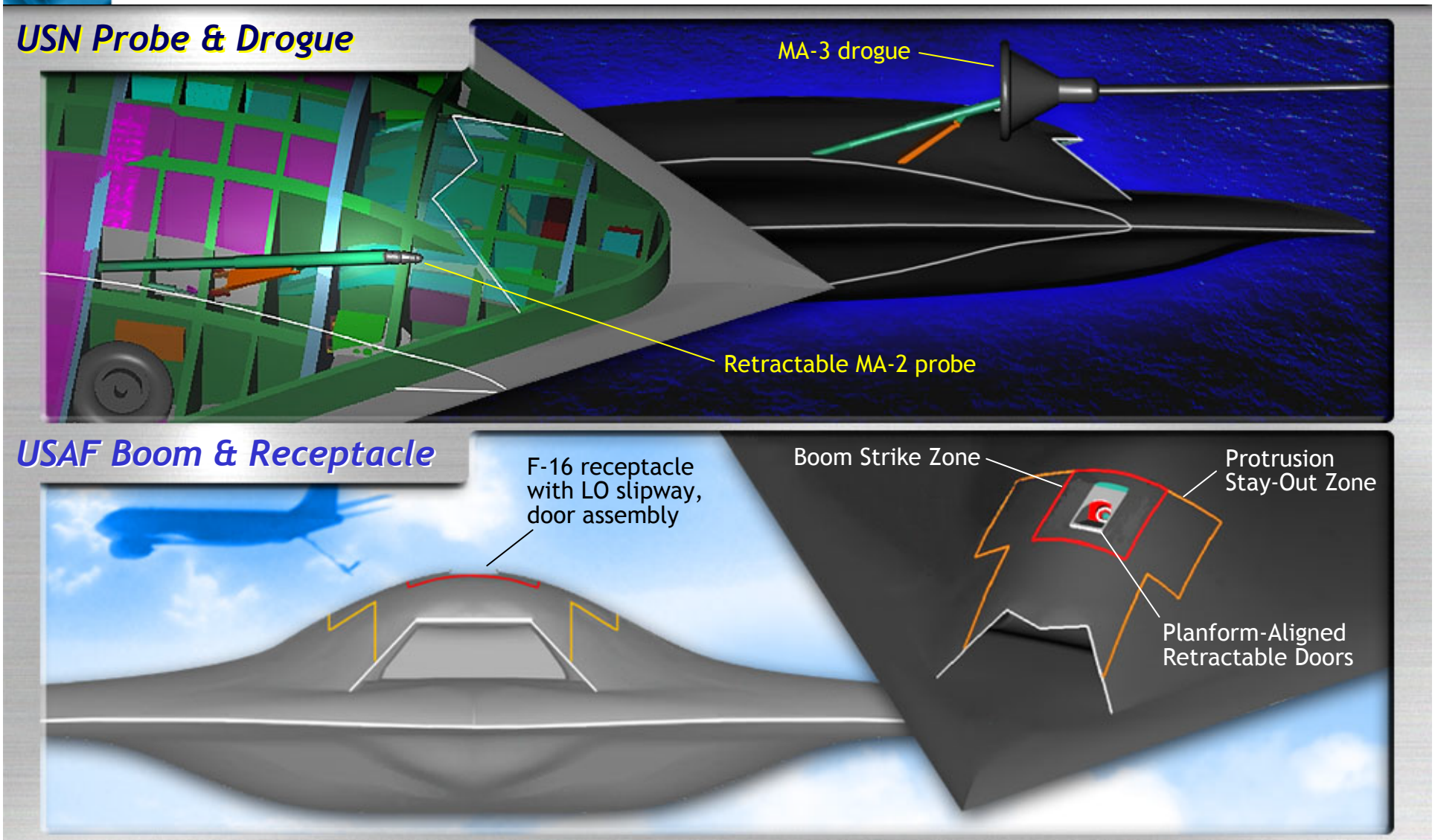
J-UCAS X-47B Air Vehicle

- **Altitude:** >40,000 ft
- **Speed:** High Subsonic
- **Payload:** >4,000 lb
- **Unrefueled range (w/max pyld):** >3,500NM
- **Sensor Provisions:** EO/IR/SAR/ GMTI/ESM
- **Air refueling provisions:** USN & USAF style
- **Mission TOGW:** >35,000 lbs
- **Basing:** Land and CV

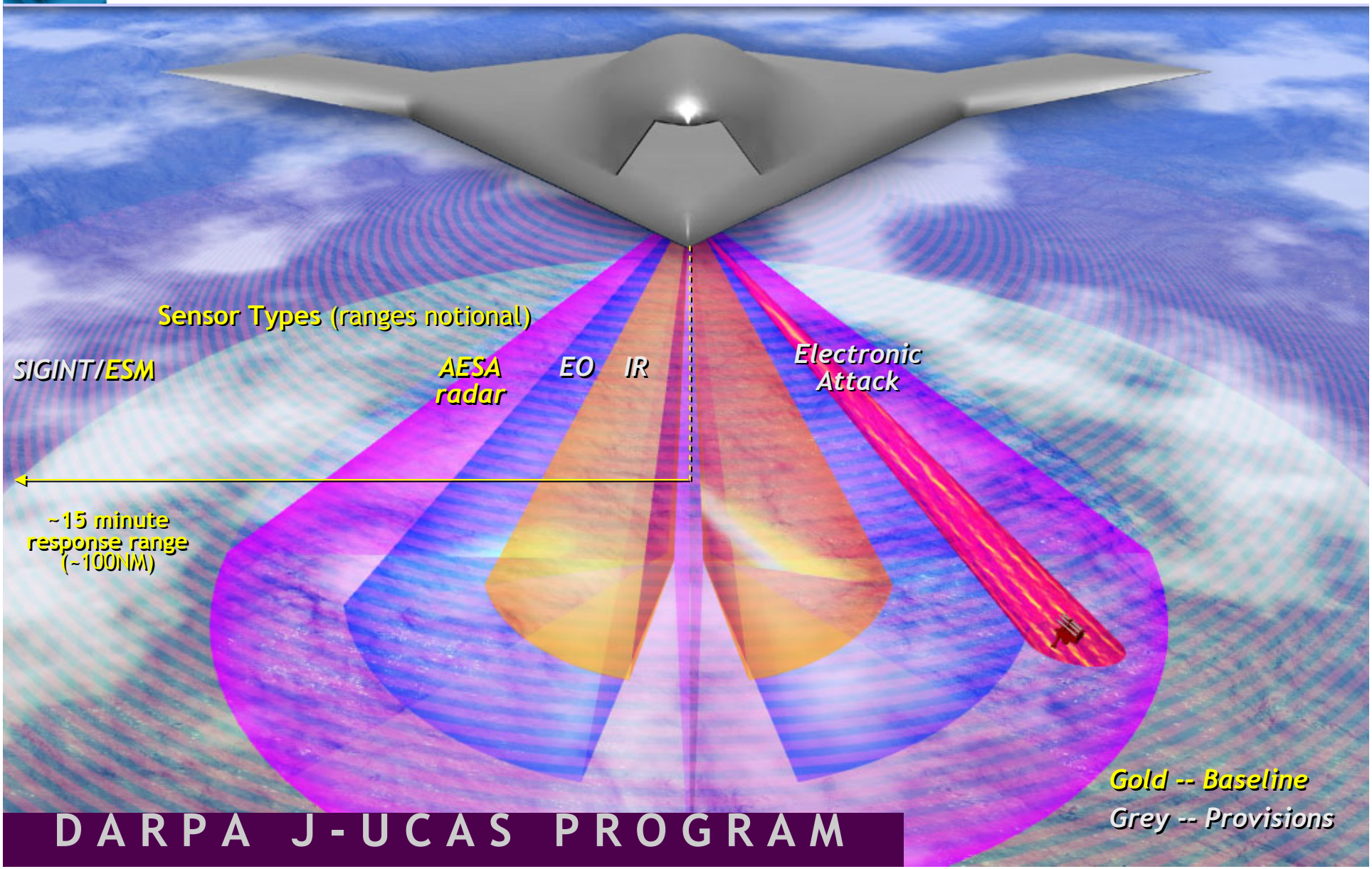
PUBLIC RELEASE

Approved for Public Release Case # 2143 - Distribution A

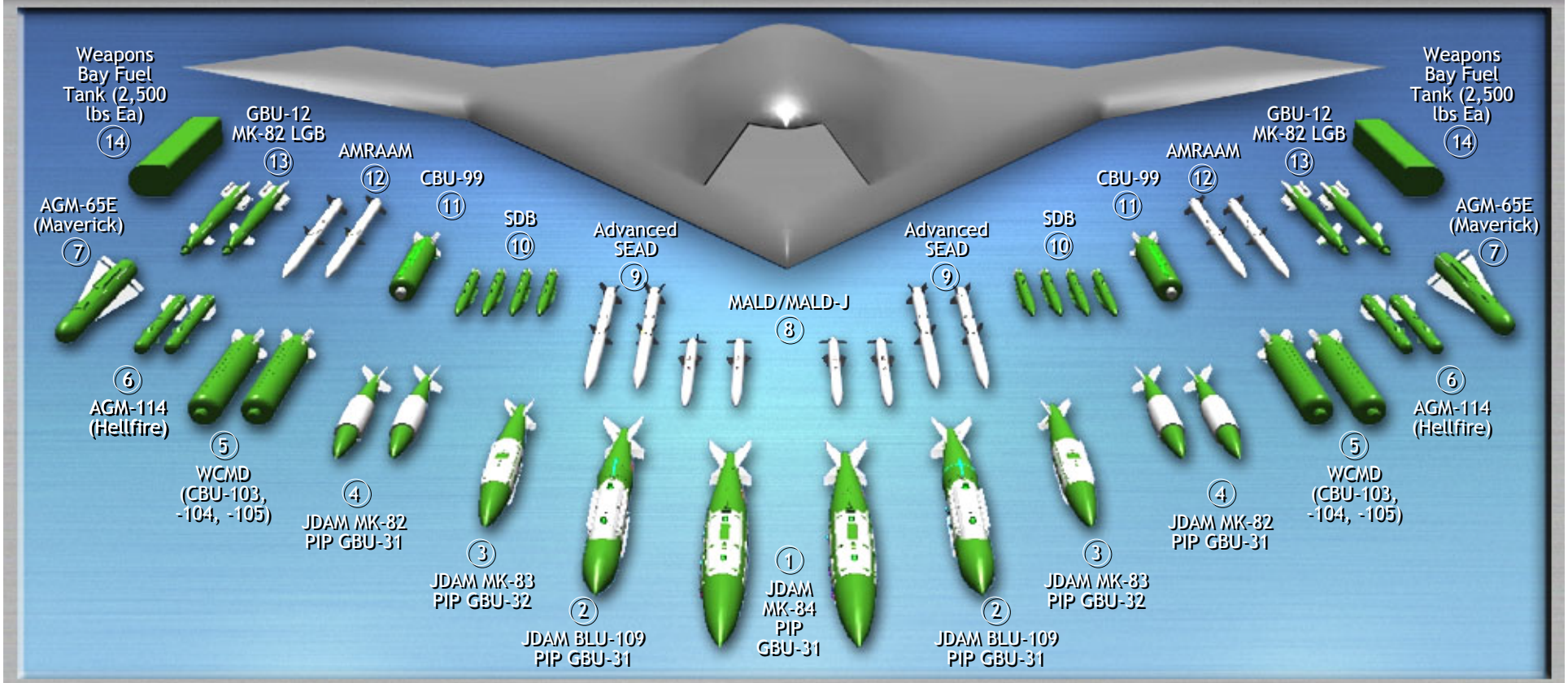
X-47B In-Flight Refueling Provisions



Initial Mission Systems: Sensing, EA



Potential Weapon Carriage (4,500Lb payload)



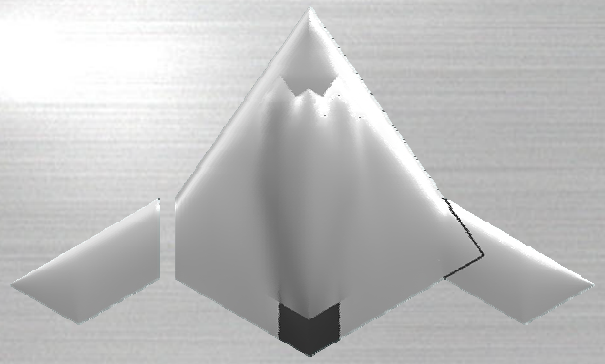
No.	Weapon	Qty
1	JDAM MK-84 PIP GBU-31	2
2	JDAM BLU-109 PIP GBU-31	2
3	JDAM MK-83 PIP GBU-32	2
4	JDAM MK-82 PIP GBU-31	4
5	WCMD (CBU-103, -104, -105)	4

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	8

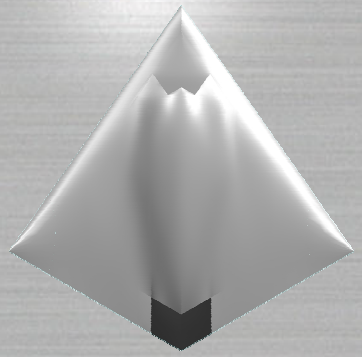
No.	Weapon	Qty
11	CBU-99	2
12	AMRAAM	4
13	GBU-12 MK-82 LGB	4
14	Wpns Bay Fuel Tank	1-2

"Gateway" Design

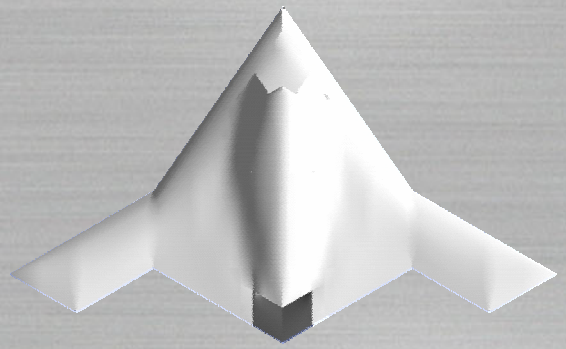
Common Center Body
- Avionics & sensor integration
- Propulsion integration
- Subsystems

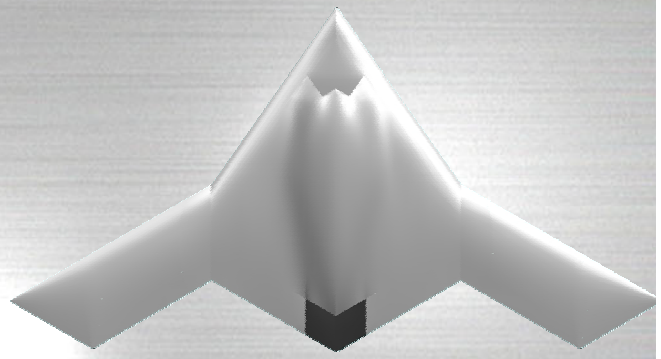


Kite Planform
- Efficient Signature
- Compact Size



"Cranked" Kite Planform
- Efficient aerodynamics
- Carrier suitable
- Wing size variable as per range/endurance requirements





X-47B permits development of wide range of production system options

Persistence is Key

*Source: Joint Staff (J-8), *CJCSI 3170.01C: The Joint Capabilities Integration and Development System (JCIDS)*, 2003

JOINT FUNCTIONAL CONCEPTS / CAPABILITY AREAS

Battlespace Awareness

- All source Intel collection
- Environmental data collection
- Own force info collection
- Predictive analysis
- Knowledge management

Protection

- Personnel and infrastructure protection
- CND
- Counter-proliferation
- Non-proliferation
- Consequence management
- Missile defense

Force Application

- Land, sea, air and space ops
- Joint targeting
- Conventional attack
- Nuclear attack
- CNA
- Electronic attack
- PSYOPS
- Special ops
- Joint fires
- SEAD
- Military deception

Command & Control

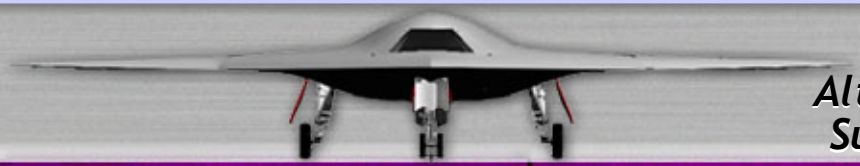
- CROP
- JFC2
- Comms and computer environment

Focused Logistics

- Deployment distribution
- Sustainment
- Medical
- Mobility
- Logistics C2

TRANSFORMATION IMPERATIVE

Assessing Relative Persistence Capability



Alternative Near- to Medium-Term Surveillance-Strike System Types

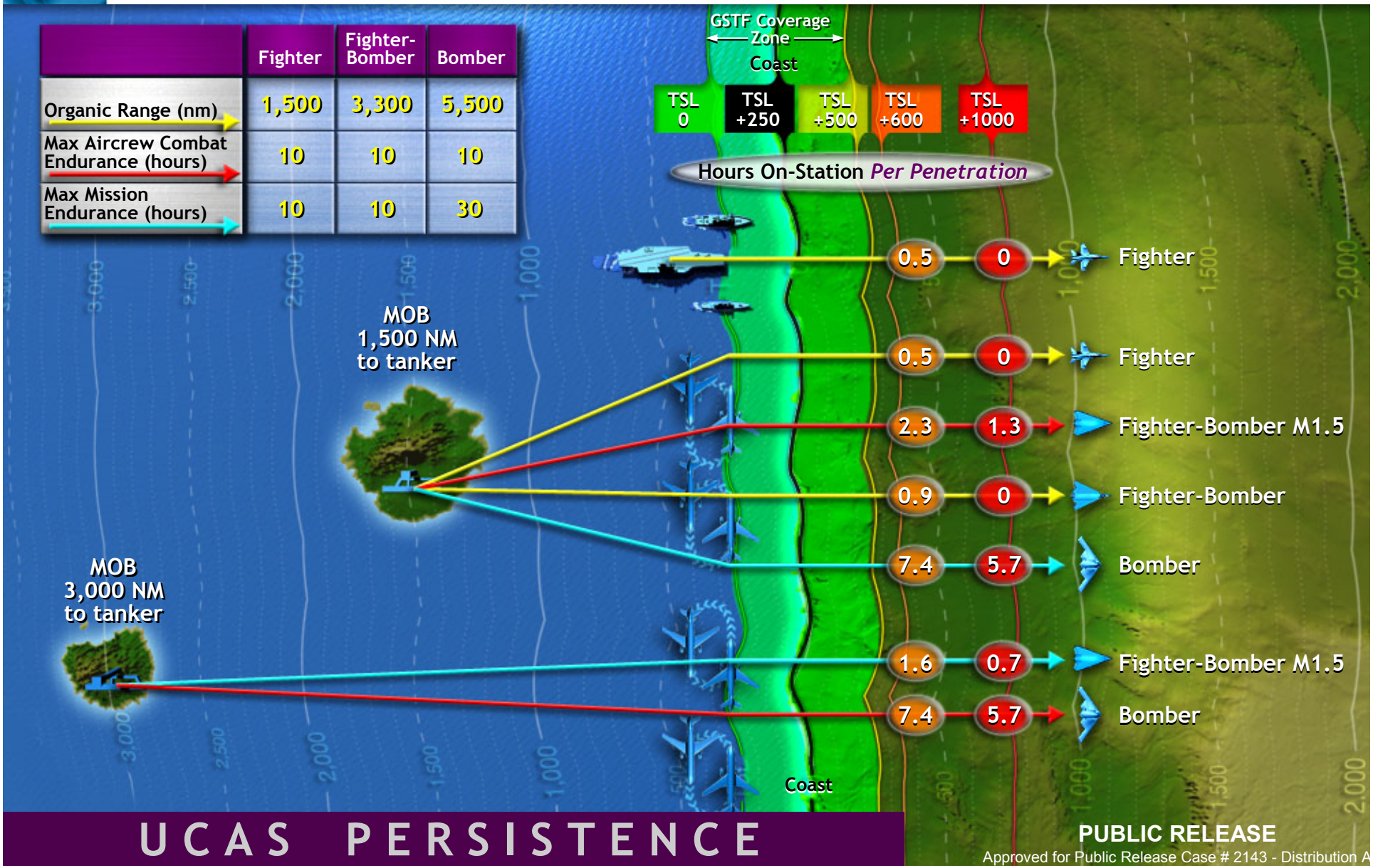
System Performance Characteristics	Notional Manned Systems				Unmanned Combat Air System**
	Strike Fighter	Fighter Bomber	Sustained Supersonic Ftr-Bomber	Bomber	
Cruise Speed (kts)	460	460	860	460	460
Unrefueled Range (NM)	1,500	3,300	3,300	5,500	3,700
Vehicle Endurance Limit	N/A*	N/A*	N/A*	N/A*	50
Sustainable Aircrew Total Mission Endurance (hrs)	10	10	10	30	N/A
Aircrew Combat Endurance (hrs)	10	10	10	10	N/A

**Aircrew endurance constraints preclude manned aircraft surpassing system endurance limits*

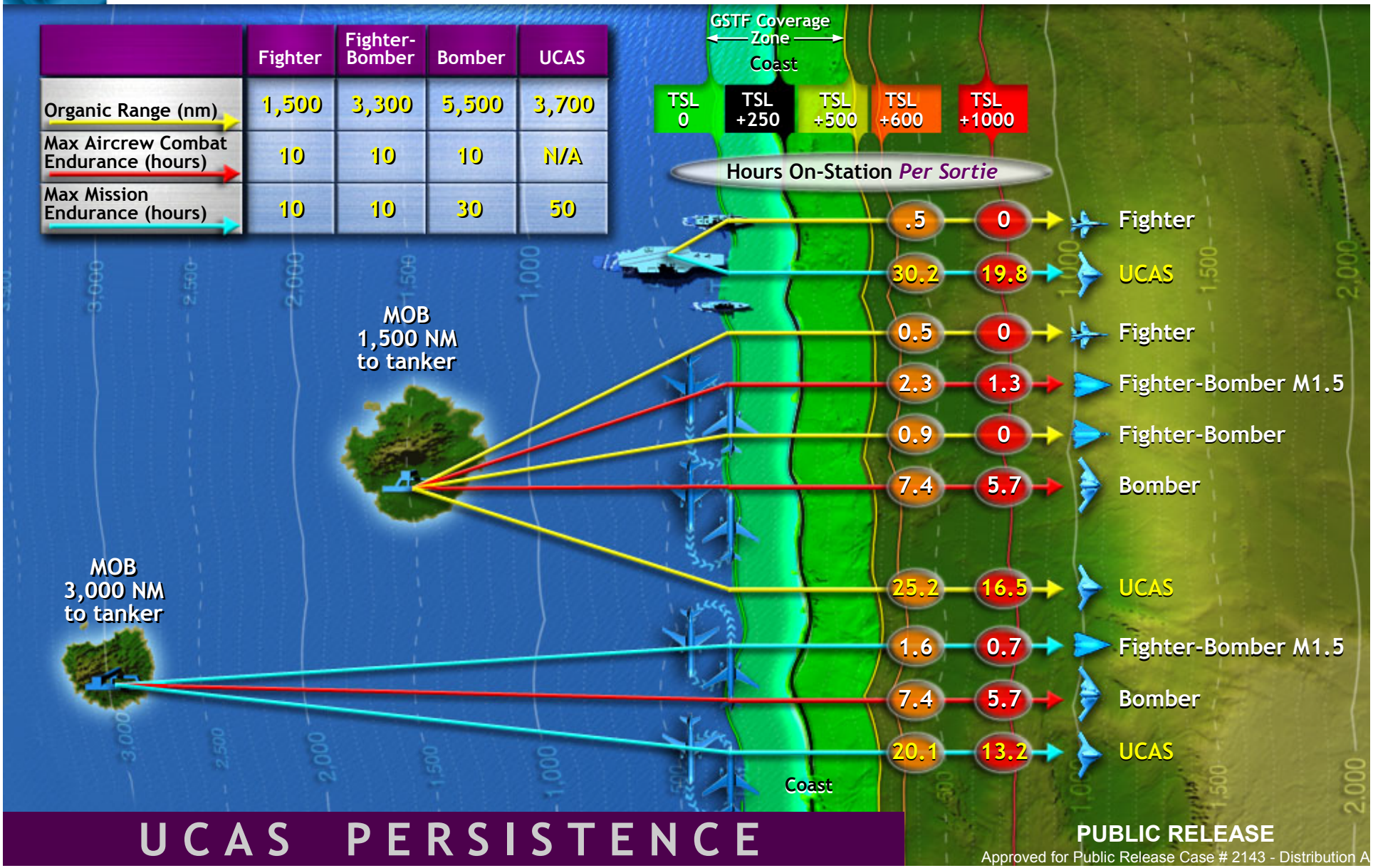
***Approximates projected performance of X-47B demonstration system – a robust precursor for TBD USAF/USN operational systems*

UCAS PERSISTENCE

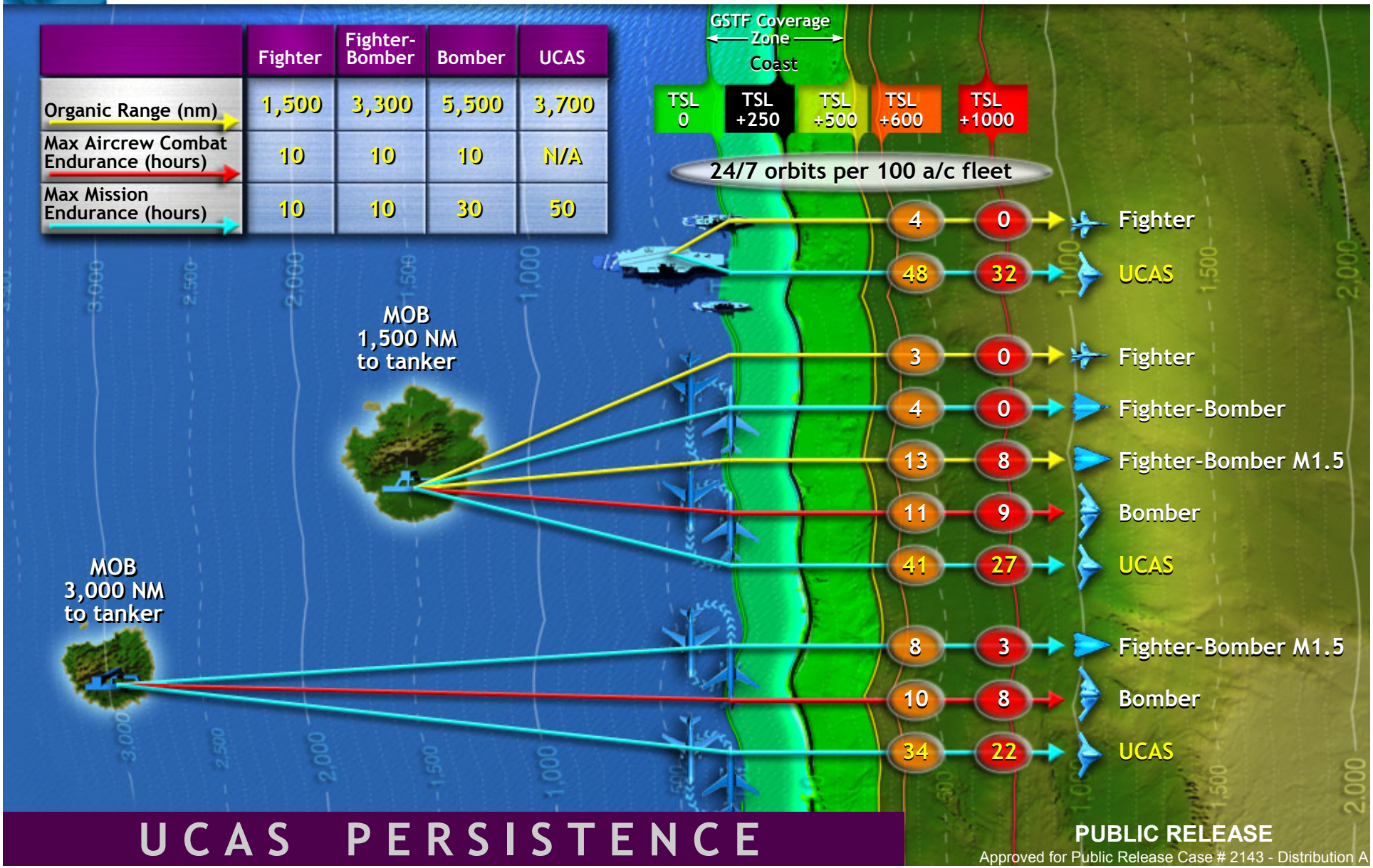
"Simple" Persistence Comparison



"Compound" Persistence Comparison

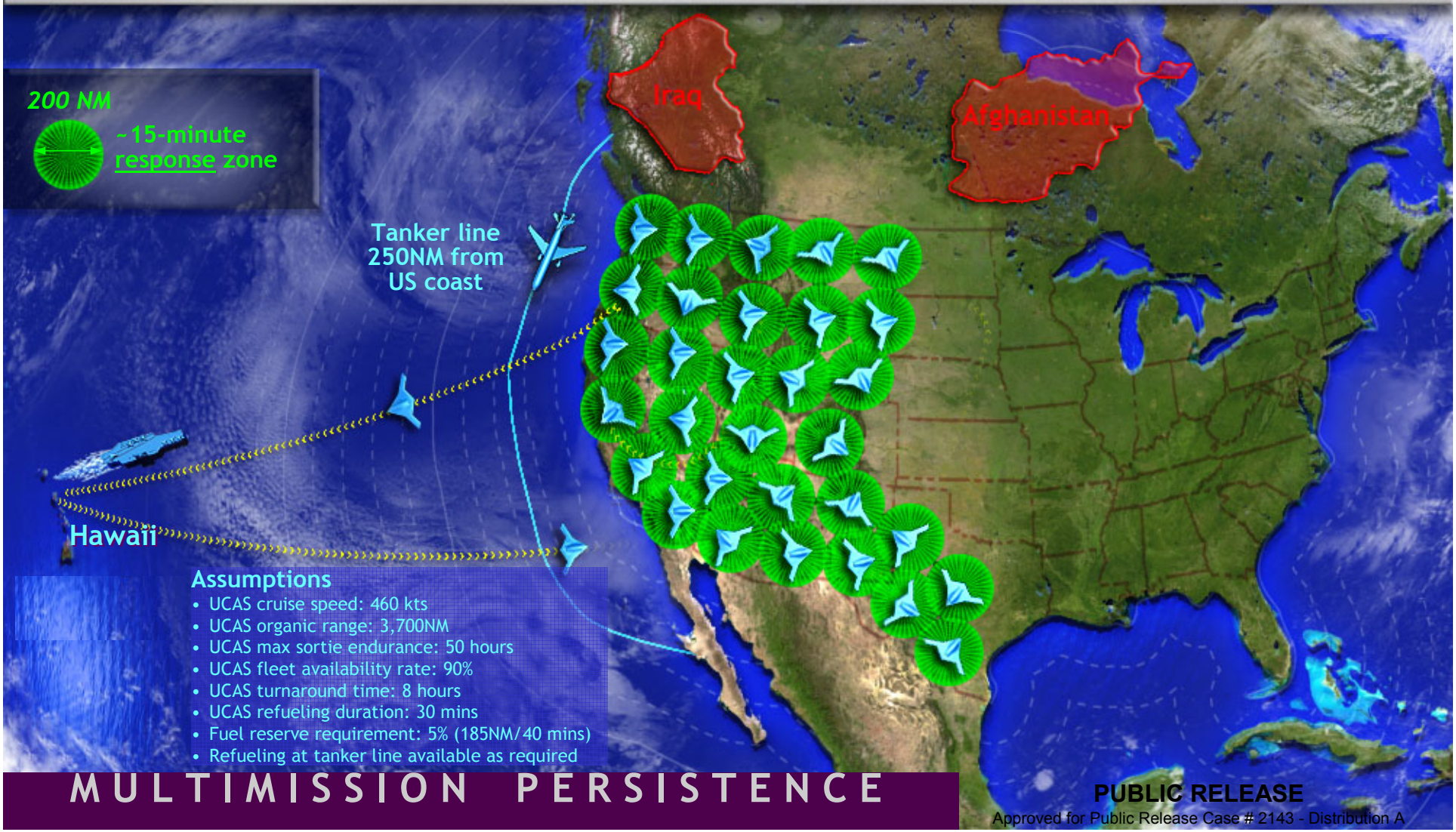


Persistent Coverage Generation



UCAS Multi-mission Persistent Coverage in Perspective

Illustrative 24/7 Surveillance-Attack Coverage of 100 a/c Fleet of X-47B-Class UCAS



MULTIMISSION PERSISTENCE

NGC X-47 Air Vehicle Plan

- **Commit to CV-capable baseline demonstration vehicle**
  - CV suitability a non-negotiable objective of a truly Joint demonstration program
  - Only one configuration is guaranteed with baseline contract—CV-suitable vehicle required to ensure achievement of joint demonstration objectives
  - CV operations most challenging vehicle-centric demo objective
- **Field highly capable vehicles as fast as possible to ensure timely capability demonstrations**
  - AV1 is CV demo bird
  - AV2 is mission demo bird
  - AV3 is all-up bird (LO, mission systems)
  - AVs 1/2 retrofittable to full mission capability

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J-UCAS 2004 Accomplishments

- Full Scale Mock- Up Built
  - RIAT/Farnborough/Miramar
- Low/High Speed Wind Tunnel Test
- J-UCAS Industry Team (JIT) Established
- OA Contract Definitized/Award - $1.03B
- Successful Key Program Reviews
  - CAIG, SRR & IBR
- Program Execution on Track

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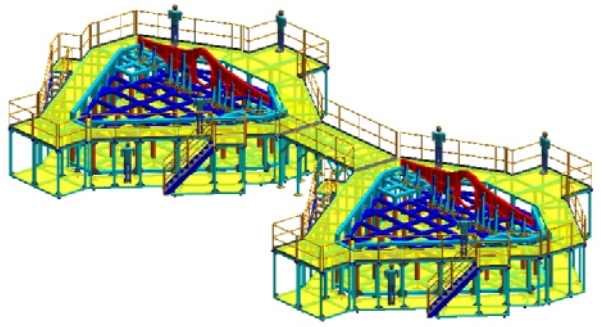
J-UCAS Program Look Ahead

FY '05 Activities

- Inlet Wind Tunnel Tests – 17 Feb, 2005
- Preliminary Design Review (PDR) – 15-16 Mar, 2005
- A/V-1 Jig Load Palmdale – Summer 05
- Critical Design Review (CDR) – 24 Aug, 2005
- Full Scale Pole Model Fabrication & Assembly – Summer 05

FY '06 Planned Activities

- Control Law and Analysis
- Surrogate JPALS Testing
- Utility System Schematics
- EO/IR Design and Integration
- Electronic Attack Design and Integration
- Landing Gear and Hook Development

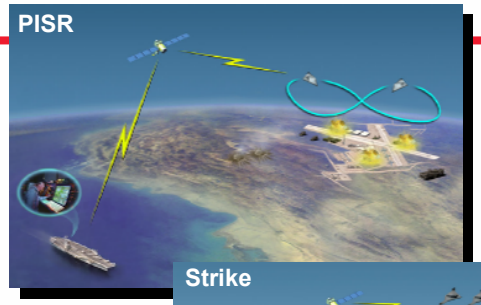


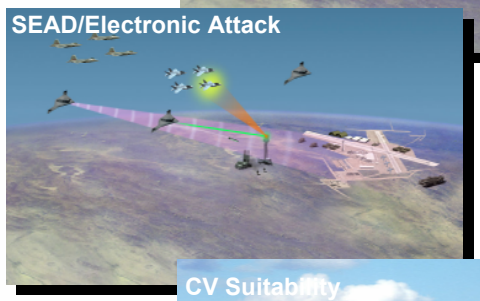
A/V-1 First Flight – Summer 07

NORTHROP GRUMMAN

X-47, J-UCAS…

- **Enables Transformational Capabilities**
  - Persistence
  - Survivability
  - Global Persistent Attack
  - Deep Strike
- **Converges Emerging Technologies, Operational Needs and Demonstration Capabilities Near Term**
- **Is a Joint Program**
  - Baseline meets CV requirements
  - Compliments F/A-22, F-35 and B-2
- **Provides OSD a Competitive Approach**
  - Reduces Cost
  - Promotes Innovation





The President's Budget Allows Continued Advancement of This Critical Warfighting Capability

NORTHROP GRUMMAN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