# OHIO Replacement

Meeting America's Enduring Requirement
for Sea-Based Strategic Deterrence

# Why Recapitalize Our SSBN Force?

*"As long as these weapons exist, the United States will maintain a safe, secure, and effective arsenal to deter any adversary, and guarantee that defense to our allies…"*

**President Obama (April 2010)**

- U.S. Strategic Deterrence Promotes Global Stability
  - Deterrence relies on the credible threat to impose unacceptable consequences
  - A survivable deterrent retains the ability to impose unacceptable consequences even after being attacked
  - Reduces the number of nuclear weapons in existence and promotes non-proliferation
- SSBN Force is a reliable and survivable leg of the U.S. nuclear triad
  - 2010 Nuclear Posture Review confirmed the enduring requirements to maintain a secure and survivable sea-based deterrent
  - SSBNs will be responsible for ~70% of deployed nuclear warheads under New START
  - Impeccable record of 142 successful flight tests
- Effective Sea-based Strategic Deterrent
  - Must have adequate range to allow operation far from adversaries, in broad ocean areas to promote survivability
  - Must have requisite stealth into the 2080s regardless of advances made by near-peer navies (stealth enables a smaller force to provide assured response)
  - At-sea SSBN requirements dictated by U.S. Strategic Command

SSBNs provide nation's most survivable nuclear deterrent

# Why Now?

- Current OHIO Class is reaching the end of its operational life
  - Designed in 1970, commissioned between 1984 and 1997
  - Operational life already extended from 30 years to an unprecedented 42 years
  - OHIO Class will begin to retire in 2027
- Lead OHIO Replacement (OR) construction must commence in 2021
  - There is no additional margin to further extend OHIO Class
  - Maintains fleet of 10 operational SSBNs through transition with moderate risk
  - 7-year lead ship construction schedule is aggressive
    - Same as VIRGINIA-Class Lead Ship despite twice the displacement
  - Lead ship strategic patrol required by 2031 to avoid gap in strategic deterrent commitments
  - Lead ship unique treaty requirements must be completed
- Common Missile Compartment (CMC) and Strategic Weapons System (SWS) designs synchronized with UK
  - Supports UK continuous at sea deterrence
  - Reduces U.S. development costs

| FY (XX) | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OHIO Class | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 743 | 743 | 743 | 743 | 743 | 743 | 743 | 743 | | | | | | | | | | | | | | | | | |
| | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 742 | 742 | 742 | 742 | 742 | 742 | 742 | 742 | 743 | | | | | | | | | | | | | | | | |
| | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 741 | 741 | 741 | 741 | 741 | 741 | 741 | 741 | 742 | 743 | | | | | | | | | | | | | | X12 | X12 |
| | 743 | 743 | 743 | 743 | 743 | 743 | 740 | 740 | 740 | 740 | 740 | 740 | 740 | 740 | 740 | 741 | 742 | 743 | | | | | | | | | | | | X11 | X11 | X11 |
| | 742 | 742 | 742 | 742 | 742 | 739 | 739 | 739 | 739 | 739 | 739 | 739 | 739 | 739 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | X10 | X10 | X10 |
| | 741 | 741 | 741 | 741 | 738 | 738 | 738 | 738 | 738 | 738 | 738 | 738 | 738 | 738 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X9 | X9 | X9 |
| | 740 | 740 | 740 | 737 | 737 | 737 | 737 | 737 | 737 | 737 | 737 | 737 | 737 | 737 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X8 | X8 | X8 |
| OHIO Replacement Class | 739 | 739 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X7 | X7 | X7 |
| | 738 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X5 | X6 | X6 | X6 | X6 |
| | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X5 | X5 | X5 | X5 |
| | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X4 | X4 | X4 | X4 |
| | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X3 | X3 | X3 | X3 |
| | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X2 | X2 | X2 | X2 |
| | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | X1 | X1 | X1 | X1 |

12 Required SSBNs

Engineered Refueling Overhaul

# OHIO Replacement SSBN

## 21st Century Capability…

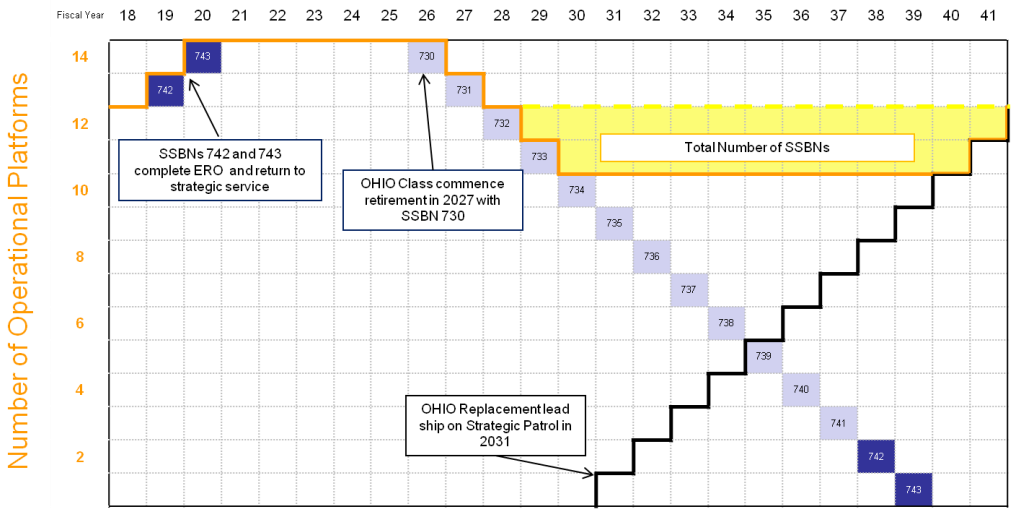

OHIO Replacement SSBN Attributes

- Sufficient payload:16 missile tubes
  - Meets USSTRATCOM requirements
  - Flexibility to handle problems across triad or degradation in strategic environment
- Sufficient stealth to address the projected threat through the 2080s
- 12 OR SSBNs to replace 14 OHIOs
  - Life-of-ship reactor core
  - Reduced mid-life maintenance period
- Maximize reuse of OHIO and VIRGINIA components to minimize cost

## In an Affordable Package…

- Lead ship construction must commence in 2021
  - First Strategic Patrol in 2031
  - Maintains fleet of 10 operational SSBNs through transition to OHIO Replacement
- Procurement timeline meets USSTRATCOM requirements with moderate operational risk during transition period - no additional room for delay
  - Low margin for unforeseen SSBN maintenance issues or late OHIO Replacement delivery
- 12 OR SSBNs needed to meet long term requirements during OHIO Replacement mid-life overhaul period

SSBN Force Structure




## At Responsible Cost…

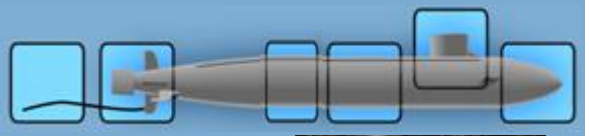
# Delivering Required Capability at the Least Cost


## Re-host Trident II (D-5)

- Most Reliable Strategic Nuclear Weapon System
- Strategic Launched Ballistic Missile (SLBM) leg responsible for ~70% of operationally deployed warheads under New START
- Long range of D-5 enables operations in broad operational areas, assuring survivability with smaller SSBN force
- Leverages D-5 Life Extension and Modernization Investments
- Avoids cost and risk of new weapon system development


## System and Component Reuse

### VIRGINIA Class

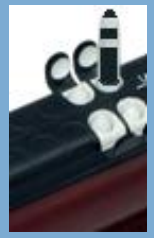


Propulsor

Ship Control System

Modular Construction

### OHIO Class

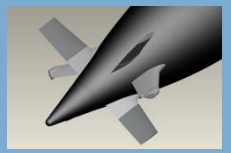


Closure Segments

Fire Control System

Strategic Weapons System and Support Systems

## New Development



X Stern

Electric Drive

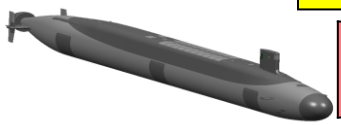
Integrated Tube/ Hull Construction

Life-Of-Ship Reactor Core

42-Year Operational Life

# Driving - Down Cost

Delivering the Core Essential Military Capability at the Lowest Possible Cost



**Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY2011** — Unit Cost CY10 $ = **$6B to $7B**

Detailed requirements review produced savings

| | |
|---|---|
| ***Reduced*** number of missile tubes | 20 to 16 tubes |
| ***Reduced*** missile tube diameter | 97 inches to 87 inches |
| ***Reduced*** torpedo room capacity | Minimum capacity for defensive load only |
| ***Removed*** chin array | Minimum acoustic sensors for defensive detection; leverage VIRGINIA-Class combat systems |
| ***Reduced*** sail mast capacity | 10 to 6 masts |
| ***Reduced*** force protection features | Current OHIO-Class system |
| ***Reduced*** OR unique design features | Increased use of VIRGINIA-Class components |

**Milestone A Service Cost Position** — Average Follow-on Ship CY10 $ = **$5.6B**

| | |
|---|---|
| **Recent Affordability Initiatives** | EOQ and multi-year procurement<br>Facilities<br>Design for producibility<br>Requirements and regulations<br>Integrated Product Development Environment (IPDE)<br>Manufacturing technologies, service, and support |

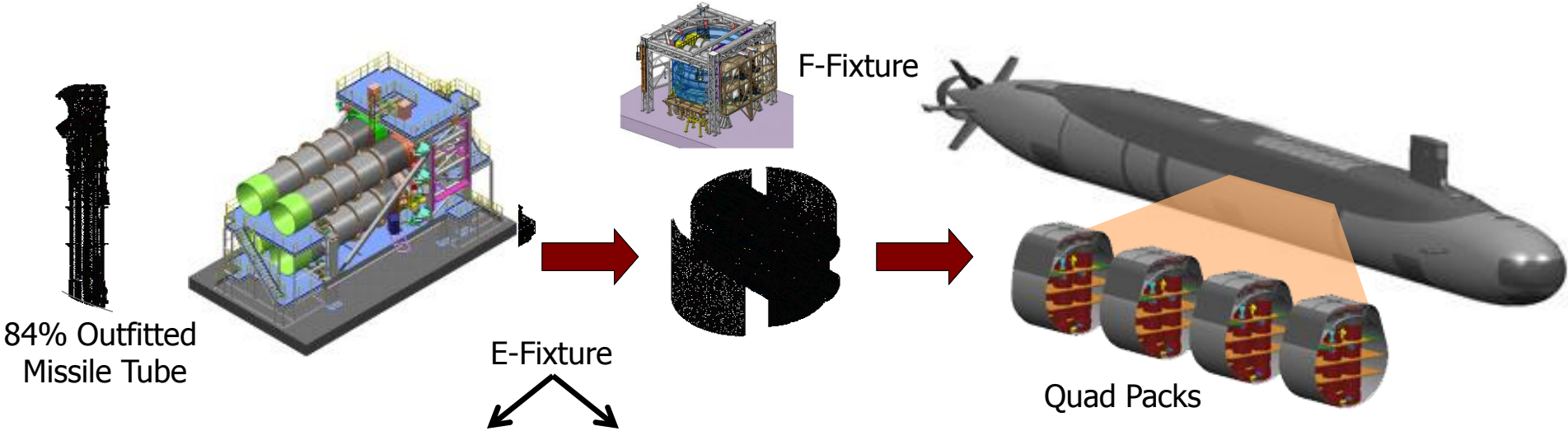
***Milestone A Cost Target*** — Average Follow-on Ship CY10 $ = **$4.9B**

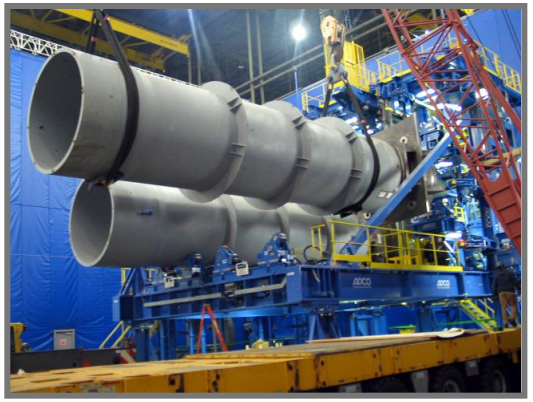
Delivering the Core Essential Military Capability at the Lowest Possible Cost

(CY10 $s) Costs developed by NAVSEA05C for OHIO Replacement Service Cost Position; Inflation based on NAVSEA 05C Jan 2010 SCN Shipbuilding Composite Inflation Table

# State-of-the-Art Construction Processes Minimize Cost and Save Time

OHIO Replacement "Quad Pack" Construction Process

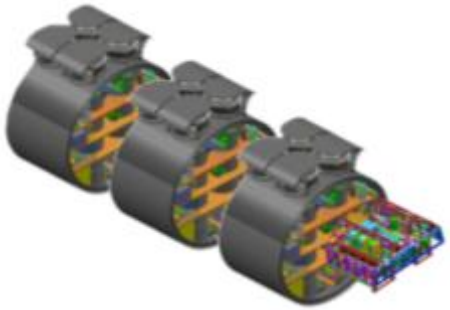



Reduces missile compartment costs and construction time

# Strategic Partnership with UK


- US and UK strategic deterrence cooperation has underpinned UK SSBN systems since the 1963 Polaris Sales Agreement (PSA)
  - UK deploys Trident II (D5) system
  - Missiles shared from a common pool
  - UK SSBN force constitutes 100% of the UK's national nuclear deterrent
- UK VANGUARD-Class SSBN force begins retirements before OHIO Class.
  - UK Successor IOC's in 2028, two years prior to OR IOC
  - Vanguard Class cannot be extended further

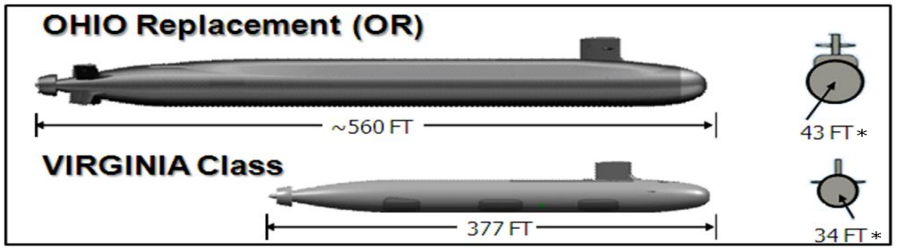


Common Missile Compartment
(12 tubes & MCCM Raft)

- Common Missile Compartment (CMC) developed under cost share arrangement
  - UK funded CMC efforts in 2008 to meet UK Successor SSBN schedules
  - CMC designed to be constructed by either nations' submarine build yards
  - Offers cost savings and economic order quantity opportunities
- U.S. committed to meeting UK SUCCESSOR need date (2028)

Common Missile Compartment efforts critical
to both U.S. and UK Strategic Deterrence

# Why Not Build a VIRGINIA With an Insert?



*Diameter

Advantages:

- Lower procurement cost per boat (~16-17% less than new design)
- Lower design cost (~28% less than new design)
- Leverages ongoing VIRGINIA-Class production line

Disadvantages:

- Largest force structure for equivalent strategic presence – 3 additional platforms required
  - VIRGINIA-Insert variant would require refueling; hull life extension required → increased force structure
  - VIRGINIA Class was not designed with SSBN maintenance philosophy → increased personnel and maintenance costs
- Highest total force life-cycle cost (estimated 12% greater than New Design)
- Acoustic signature vulnerable to projected threats – lacks survivability
- Freeboard and ballast issues would require substantial redesign

VIRGINIA SSBN variant has a higher class cost with less capability

# Why Not Rebuild an OHIO Class?

Advantages:

- Lower procurement cost per boat (~10-13% less than new design)
- Lower design cost (~14% less than new design)
- Less technical risk than VIRGINIA-Insert

Disadvantages:

- Vulnerable against projected threats
  - Insufficient stealth at patrol and transit speeds - survivability risk against a committed future adversary
- Requires reconstituting OHIO construction capability
  - OHIO-Class production line shutdown in 1990s
  - Cannot take advantage of modern modular construction techniques
  - Obsolescence issues of legacy OHIO technology necessitates redesign
  - Would require upgrade to meet modern construction requirements (e.g. environmental regulations)

OHIO does not pace expected threats and requires extensive re-design

# OHIO Replacement Ensures Strategic Deterrence into the 2080s

- **The U.S. will retain nuclear weapons for the foreseeable future**
  - Other nations are modernizing their nuclear systems
  - NPR 2010: "As long as nuclear weapons exist, the United States must sustain a safe, secure and effective nuclear arsenal…"
- **The Triad (SSBNs, ICBMs, Bombers) provides effective nuclear deterrence and assurance**
  - Each leg of the Triad brings its own unique benefits
  - Result: flexibility, responsiveness, survivability
- **Deployed U.S. strategic warhead numbers have decreased significantly, however majority are now carried by SSBNs**
  - Reduced by more than 75% since 1989 peak
  - Paralleled by Russian reductions
  - SSBNs now carry ~70% of deployed warheads under New START
- **The SSBN force provides the U.S. with a survivable assured response capability**
  - CJCS "…the SSBN fleet is the most survivable leg of the Triad, I consider it indispensable"
- **SSBNs use adaptability to cope with change**
  - 50+ years of design and operational experience
  - A history of adaptation to changes in targets, payloads, defenses, ASW and diplomatic/basing constraints
- **The current OHIO Class SSBN force is reaching the end of its operational service life**
  - The OHIO SSBN service life has already been extended from 30 to 42 years (unprecedented for a nuclear submarine)
  - Additional OHIO life extensions are unrealistic
  - OHIO will begin to retire (at a rate of 1 per year) in 2027
- **Further delays in the OHIO Replacement SSBN would gap at-sea strategic requirements**
  - Two-year delay to 2021 improved design maturity and produced manageable risk during SSBN transition
  - Additional delays are not manageable and will gap requirements
- **OHIO Replacement SSBN meets the 21st century requirement for survivable strategic deterrence at minimal cost**
  - Employs proven OHIO D5 Strategic Weapon System
  - Sufficient stealth to address the projected threat through the 2080s
  - Delivers the at-sea presence of 14 OHIO SSBNs with only 12 OHIO Replacement SSBNs
  - Cost-effectively recapitalizes SSBN force
  - Incorporates VA systems and cost control lessons
  - Designed for affordability, reduced life-cycle costs, and improved availability

**OHIO Replacement leverages 50+ years of SSBN design and operation experience and combines it with the cost-control lessons of the VIRGINIA-class SSN to provide an assured response capability for the future in a lean and cost-efficient manner**

The OHIO Replacement SSBN is a cost-effective recapitalization of our Nation's sea-based strategic deterrent