



Considerations for Next Generation Combat Systems

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Current Navy Combat Systems

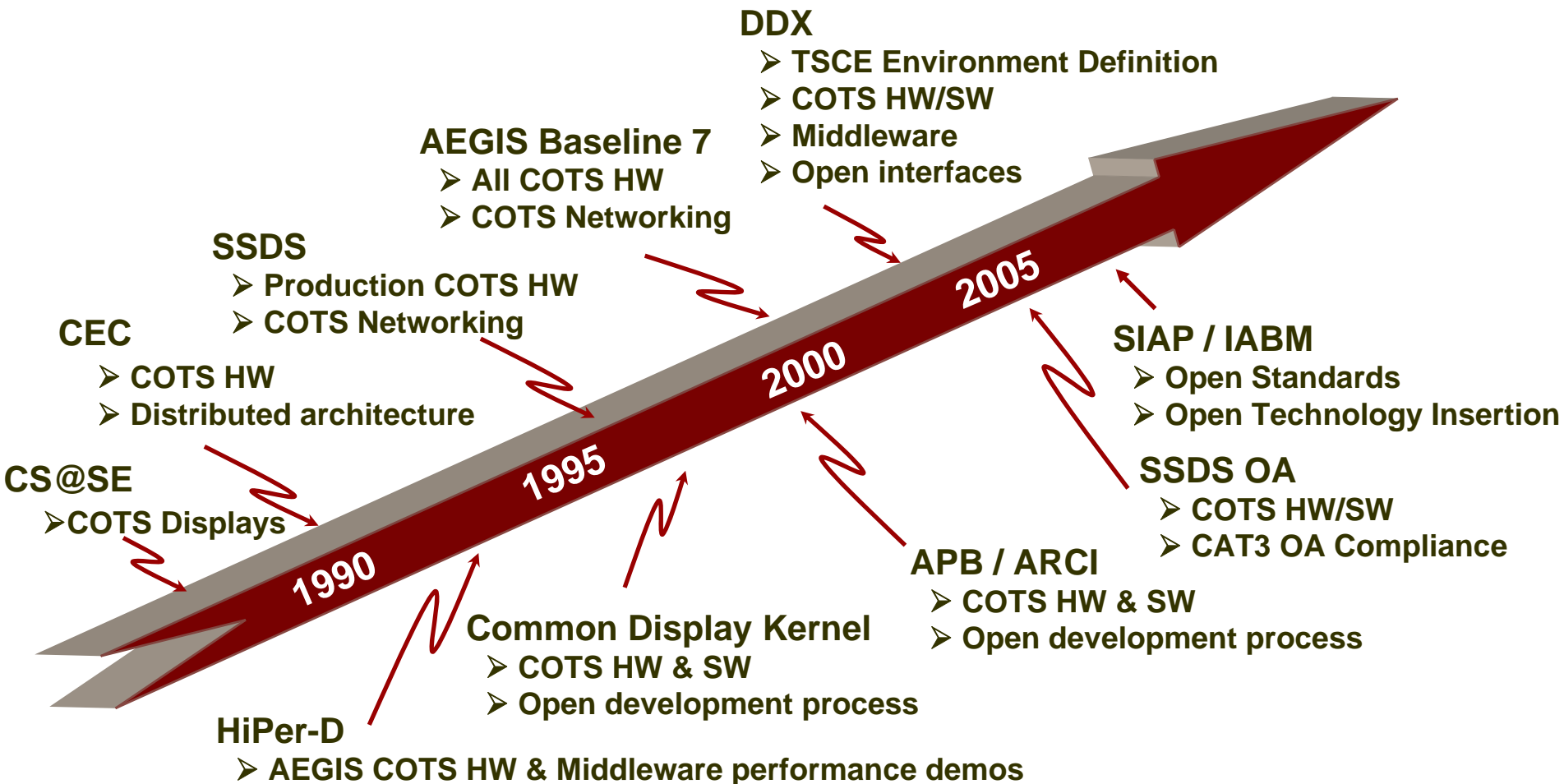
- **Aegis Cruisers and Destroyers almost complete**
 - **Modernization programs will increment capability**
- **Ship Self-Defense Systems being installed on CVNs and Amphibs**
- **Cooperative Engagement Capability (CEC) being installed as is**
- **Open Architecture (OA) is not a Combat System**
 - **Focus is more on affordability through commonality**
- **SIAP is only one dimension of combat system capability**
- **DD(X) Combat System is an evolutionary step to OA**
- **LCS Combat System resulted in insufficient littoral defense**

Where are we going? What is the future of combat systems?

Future Combat System Challenges

- **Multi-unit, cross mission real-time planning**
- **Net-centric Command and Control**
 - **Control of multi-unit, dispersed and different forces**
- **Use of wide-band information**
 - **ISR Sources and GIG databases**
 - **Maritime Domain Awareness**
 - **NCID and discrimination**
- **Radar resource management**
- **Weapons resource management**
- **Reduced manning compatibility with hi intensity multi-dimensional warfare**

Evolution to Open Architecture



Advances and Challenges in Pursuing Open Architecture

A Navy Combat System Perspective

- **Advances**
 - **Capitalize on COTS HW**
 - **though each program is independent**
 - **Use of COTS middleware and standards**
 - **Application of modern software development and testing techniques**
- **Challenges**
 - **Achieving “plug and play” compatibility**
 - **Ensuring interoperability**
 - **Testing efficiency**
 - **Industry incentives**
 - **Training, maintenance, and logistics**
 - **Forward / backward interoperability**

Current APL-related OA Activities

A Brief Summary

- **ARCI and APB processes for submarine community**
- **Common SIAP**
 - **IABM concept, development, and testing**
 - **JTM (Joint Track Manager) Architecture**
- **Support to IWS-7**
 - **ARCI process expertise**
 - **Proposals for prototyping open process:**
 - **MMSP, surface tracking, performance based engagement**
- **AAW / BMD baseline merge (OA compliance)**
- **Aegis OA technical review**
- **APL IRAD: Next Generation Combat Systems**
 - **Common components and systems engineering process**

Next Generation Combat Systems Environment



E2C



National Assets



DDG 1000



CV



CG/CG(X)



LCS



Mission Ops



DSP/SBIRS



Deployed Forces



JSTARS



THAAD



PAC-3

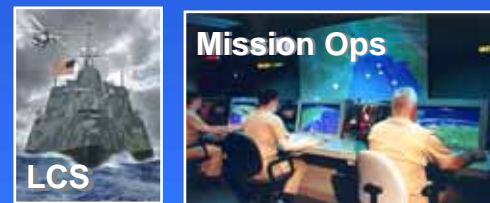


Global Hawk



National Intel

Next Generation Combat Systems Attributes

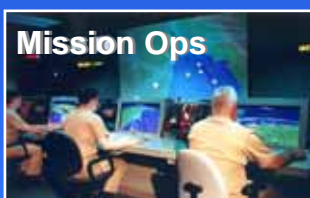
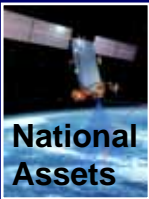


- NOT Single Unit/System Centric
- Joint – from the Start
- GIG Compliant
- IAMD Architecture Compliant
- Multi-mission



Next Generation Combat Systems

- Global Command and Control
- Distributed Collaborative Mission Planning
- Mission Sensor Planning & Asset Stationing
- Real-time Intelligence and Crisis Action Planning



Next Generation Combat Systems

- **Single Integrated Picture**
 - **Net-Centric, Globally Integrated**
 - **Air, Maritime, Space**
 - **Consistent Combat ID**
 - **Real-time ISR and All Source ID and Tracking**
- **Netted Early Warning (Space, Air, Ground)**



E2C



National Assets



DDG 1000



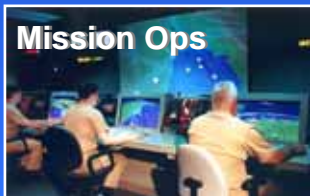
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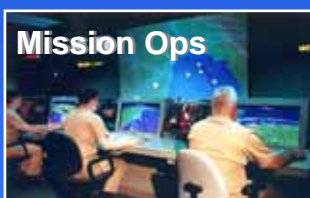
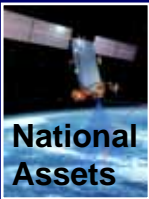
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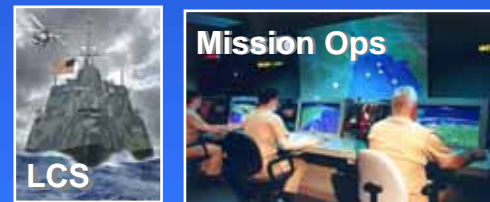
National Intel

Next Generation Combat Systems

- **Advanced Battle Management**
 - **Integrated Fire Control**
 - **Distributed Weapons Control**
 - **Distributed Sensor Control**
 - **Real-Time Coordinated Engagement Planning**



Next Generation Combat Systems



- **Coordinated Attack Operations**
 - Air, Strike, Artillery, etc
 - Information Operations
 - Ship, Air, Ground Maneuvers
- **Time-Critical Strike**
 - Real-time ISR to shooter control loop



Conclusions

- **We are very focused on the present systems and requirements**
 - **Affordability trumps capability considerations**
- **Historical sponsored work on advanced combat system capabilities has diminished significantly**
 - **Even S&T efforts are difficult to sustain**
- **It is time to do a forward look at future combat system architectures and characteristics**
 - **Start to work on key enabling technologies**
 - **Create a vision that will inspire sponsors to invest limited funds**
- **Need to take advantage of our collective experience Lab-wide**
 - **Multiple warfare areas**
 - **Different acquisition approaches**
 - **Various sensor and weapon technologies**
 - **Innovative processing and HMI**