

# Using DevOps Principles to Transform Navy Combat Systems

**Captain Andrew Biehn, USN**



# CAPT Andrew Biehn, USN

- Career Surface Warfare Officer – 27 years
- 5 deployments at sea, 1 on land (Afghanistan)
- NOT an engineer or computer scientist
- Commanded an AEGIS Destroyer
- Led the AEGIS Program





360,000 uniformed personnel  
150,000 civilians  
295 ships  
2,600+ aircraft

On watch 24/7 for 247 years to:

*Support and Defend the Constitution of the United States against all enemies, foreign and domestic*

By:

*Conducting prompt and sustained operations incident to combat at sea*

**A combat-credible U.S. Navy—forward-deployed and integrated with all elements of national power—remains the Nation's most potent, flexible, and versatile instrument of military influence.**

# Foundational Principles

## Constants

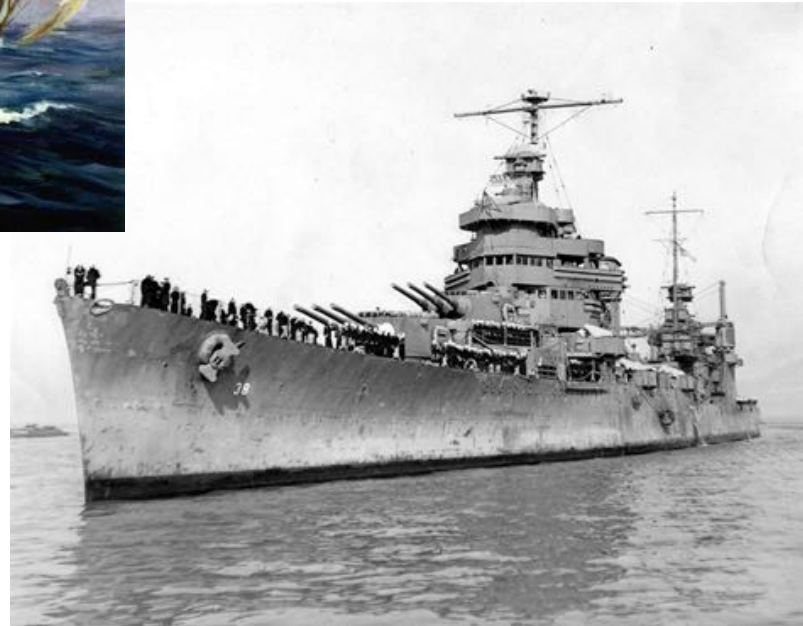
- Attack Effectively First
- Observe, Orient, Decide, Act (OODA) Loop
- The Sea
- The Fire Control Loop

## Variables

- Technology
- Targets
- Range and Speed of Weapons
- Sensors



# Evolution of Naval Gunfire



- Platform-based
- Open architecture
- Evolved as quickly as the technology did

# The Missile Age



# AEGIS



- Platform-based
- Tightly coupled architecture
  - Weapons system to ship
  - Software to hardware
- Superbly effective, but difficult to rapidly evolve



# Modernization Challenges



- New hardware
- New software
- Intrusive ship changes
  - Hull cuts
  - New cabling
- Time-consuming
- **EXPENSIVE**



*How do we deliver combat system capability at the speed of technological change?*

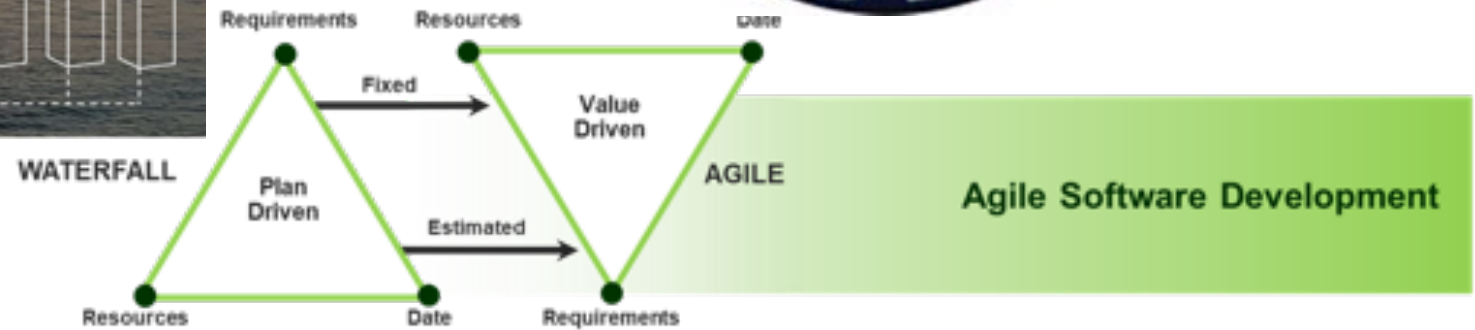
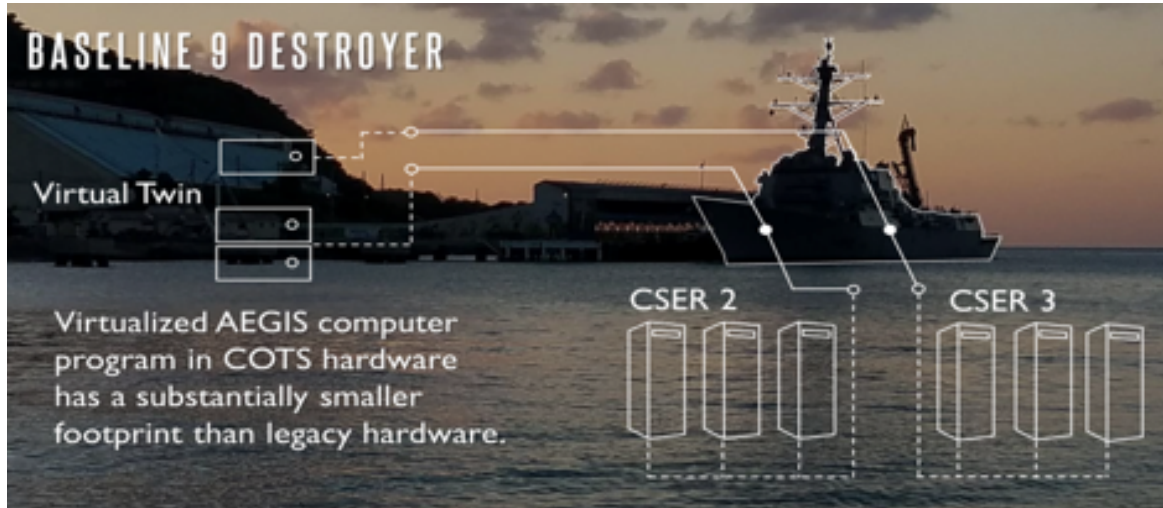
## *The Three Ways*

*Maximize Flow*

*Amplify Feedback Loops*

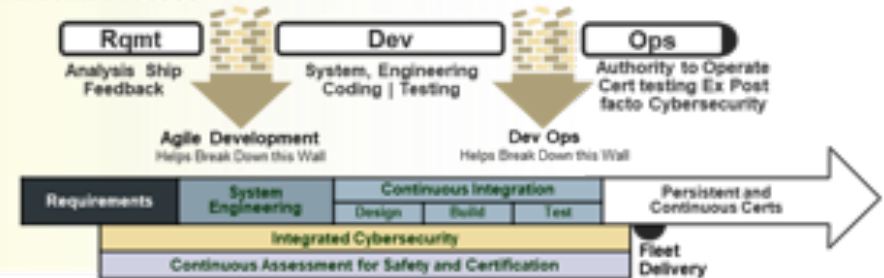
*Culture of Continual Experimentation and Learning*

# Flow/Systems Thinking



## DevSecOps Culture and Practices

### Traditional Process



# Amplify feedback loops

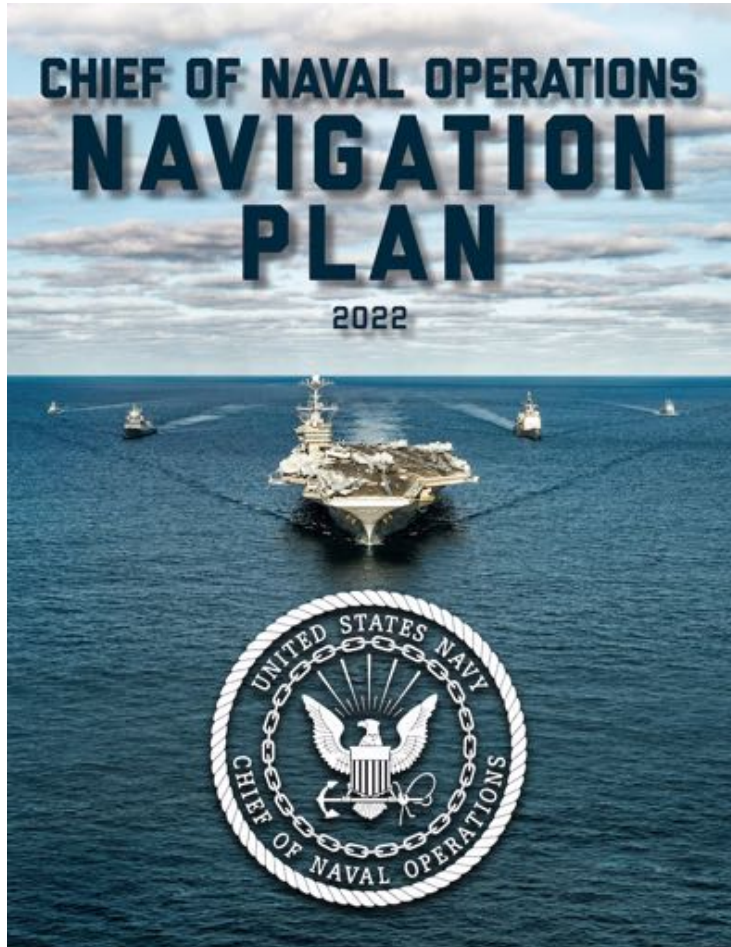


# Continual Experimentation





# Influencing the Navy's Vision



*Our adversaries are investing heavily in emerging technologies. In response, the Navy will adopt a more agile approach to experimentation and force modernization, leveraging partnerships with industry and academia. We will promote a culture that embraces new concepts and prioritizes critical areas for investment, while also preparing to rapidly adapt —fast follow—in others. Working closely with allies and partners, we will expand our partnerships across the entire technology ecosystem. We will include Sailors early in the development process, listen to their ideas, and drive healthy feedback loops with the industrial and innovation base.*

# Endstate: Networks Defeat Platforms



# Help I'm Looking For

- I'd love to talk to anyone who is transforming legacy real-time software into a modern architecture to support CI/CD
- I encourage innovative people and companies to explore how they can contribute their skills to provide better tools for our Sailors and Marines (I'd love to help!)
- I ask you to talk to talented people about considering a career in public service (in uniform or out)