



NAVAL SURFACE WARFARE CENTER PORT HUENEME DIVISION

Battle Damage Recovery

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Outline



- **Historical Damage Recovery**
- **Ships Are Survivable**
- **Survivable \neq Mission Capable**
- **Modeling, Simulation, and Test**
- **The Future**
- **Questions**

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Historical Damage Recovery Example



In WWII

USS Lindsey Example

- Weapon systems continued to function after the ship took damage, (i.e. guns).
- The enemy did not have precision weapons. Damage was more random

5 in 38 was operational in 2 mins after hit

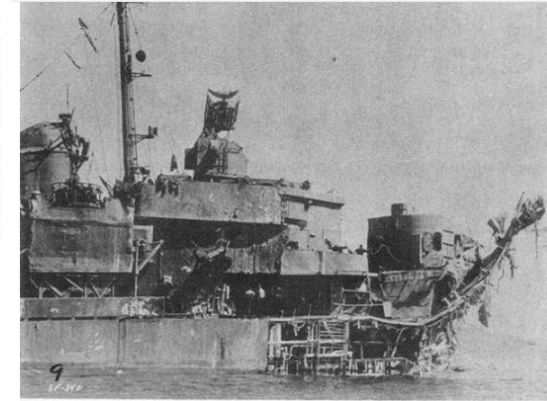
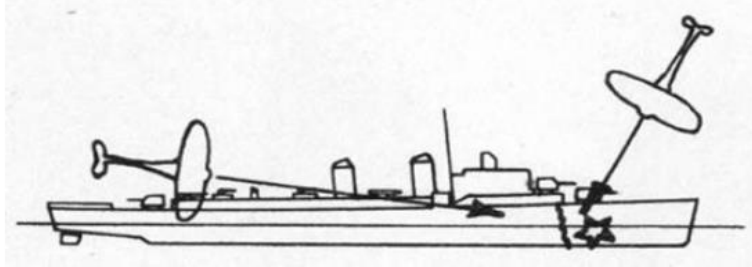
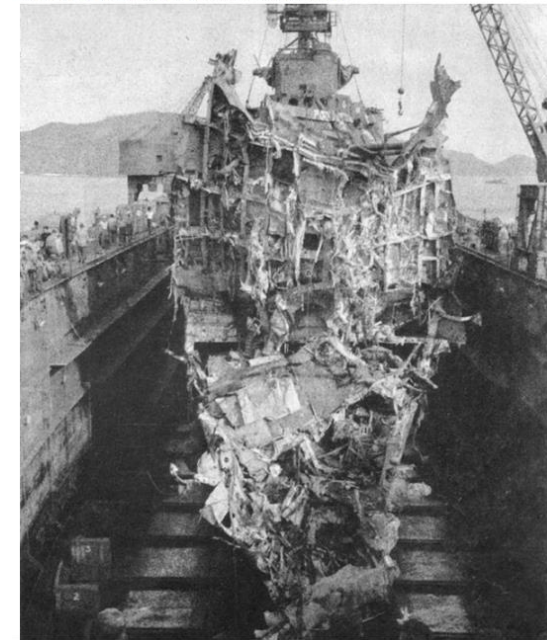


Photo 2-3: LINDSEY (DM32) At Kerama Retto before docking: April 1945.



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Today, Our Ships Are Survivable



SINKEX Video

<https://www.navy.mil/Press-Office/News-Stories/Article/2736525/us-forces-conduct-sinking-exercise/>

F-35C Joint Strike Fighters **Joint Standoff Weapon**;

P-8A Poseidon maritime patrol and reconnaissance aircraft **Harpoon**;

U.S. Marine Corps **Naval Strike Missiles**

F/A-18C Hornets **Harpoons**

SSN **Harpoon** and **MK 48 Advanced Capability torpedo**

Conclusion: Current Warships are survivable

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Survivable ≠ Mission Capable



Today

- Our weapon systems are integrated
- Recovery from damage is a longer process

RECOVERABILITY ENHANCEMENTS (CAPABILITY RESTORATION)		
Recovery Area	Mission Recovery Enhancement	Capability or Component
Loss of mission critical and vital systems	Reconfiguration and reconstitution	Casualty power, ships drawings and common diagrams, portable communications, spares, separation and redundancy of systems



USS McCain

- Damage as suffered by USS McCain collision with Alnic MC
 - *the breach "resulted in flooding to nearby compartments, including crew berthing, machinery, and communications rooms."*
- The Ship was not mission capable from August 2017 through October 2019*
- 2 years vice 2 mins**
- The biggest need is appeared to quick "digital repairs" to restore the ship's combat systems
- Could "digital repairs" at located near weapon system be effective?

*Repairs to USS McCain included upgrades

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Modeling, Simulation, and Test



2023 NSWC Carderock and NSWC Port Hueneme

- Modeled damage on a USS destroyer
- Identified damaged equipment and personnel loses



- Examined what systems needed to be restored in order recover partial combat capability



2024 NSWC Port Hueneme

- Demonstrated a hardware solution that accomplished the digital repair and restored partial combat capability!



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The Future More Complex Recovery



Before Static Detonation



2023 NSWC Carderock and NSWC Port Hueneme

- Examining 3D Models made with photogrammetry
- AI to assist in finding the right pipe or cable to repair

After Static Detonation



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Questions ?



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