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Development of Shipboard Equipment Shock Survivability Assessment Technique (Continuation)

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DEVELOPMENT OF SHIPBOARD EQUIPMENT SHOCK SURVIVABILITY ASSESSMENT TECHNIQUE

Naval Postgraduate School

Problem

- The Navy demands that shipboard systems and equipment must be certified to survive non-contact shock events in an Underwater Explosion (UNDEX) environment.
- In order to fully address shock hardness of shipboard equipment both ***material*** and ***functional failure*** must be assessed.

Floating Shock Platform Test for Shipboard Equipment

Research Objective

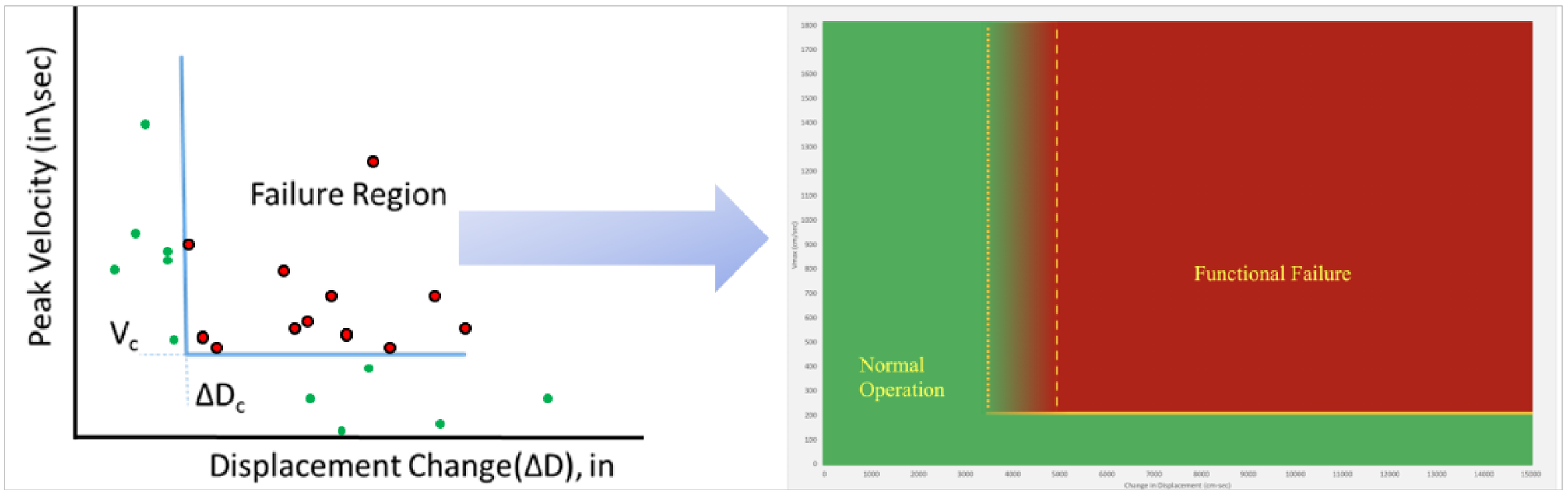
Improve the current shipboard equipment shock qualification process through a reduction in the uncertainty of failure prediction over conventional shock qualification testing alone.

Approach

- Numerical Experimentation is used to:
  - Improve accuracy of existing ship shock structural models
  - Develop a representative functional failure model of equipment critical components
  - Determine appropriate failure criteria for shock hardness assessment of shipboard equipment
  - Assess shock hardness of shipboard equipment via simplified numerical models using shock loading from realistic threat cases

Conclusions

- Current standards can be updated to reduce uncertainty in shipboard equipment shock assessment via functional failure determination
- Increased accuracy of numerical models is possible based on damping model correlation with measured test data
- Capture of physical test base shock motion and equipment response facilitates shock hardness assessment
- Multi-factor failure criteria using (*Max Velocity* and *Change is Displacement*) definitively bounds the failure region
- Use of simplified equipment models in conjunction with full ship shock models enables evaluation of full shock loading across entire range of shock severity cases



Multi-Factor Failure Criteria for Shock Assessment

Future Work

- Construct physical representative functional failure model and conduct laboratory testing to corroborate numerical experimentation results

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