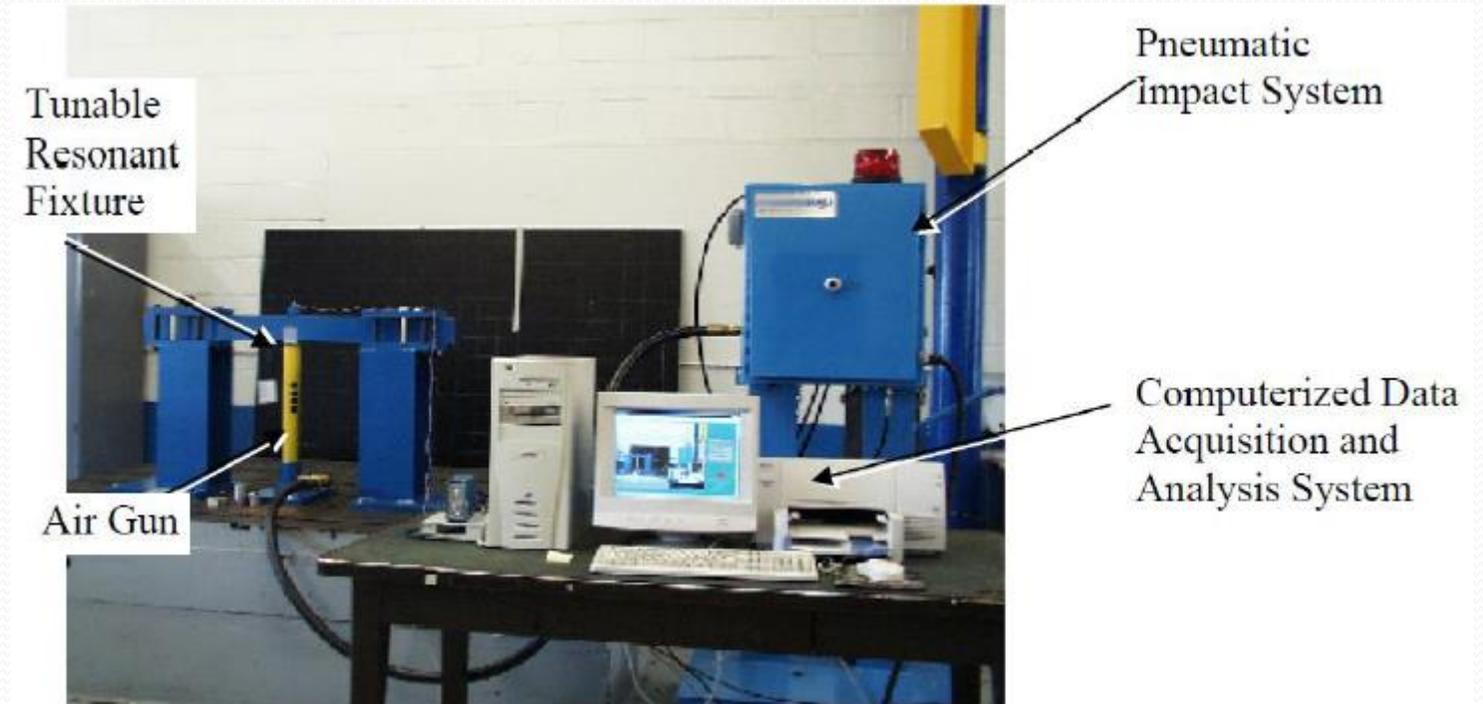# Pyroshock Modeling

Sponsor: Harris Corporation, Robert Wells
Advisor: Dr. Kumar

Instructors: Dr. Helzer, Dr. Gupta, Dr. Shih

Students: Nathan Crisler, Charles DeMartino, Chad Harrell, Chase Mitchell

Catch-up:

- Background
- Specifications

Tunable Resonant Fixture

Air Gun

Pneumatic Impact System

Computerized Data Acquisition and Analysis System

Here and Now:

- Brainstorming
  - Pulse Generation
  - Current Test Demonstration
    - https://www.youtube.com/watch?feature=playe
  - Data Acquisition
  - Software Selection
   - MATLab Preferred
    - C or C++ possible
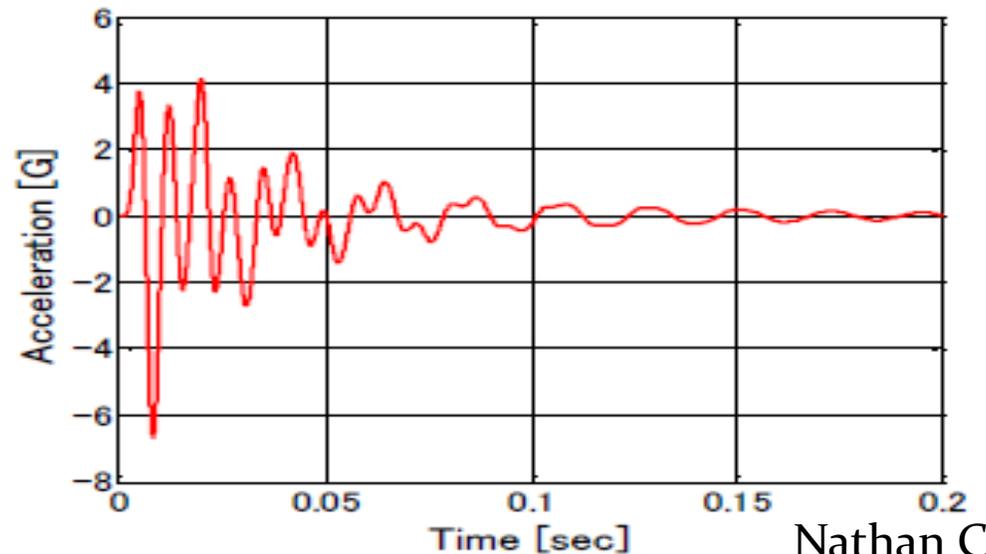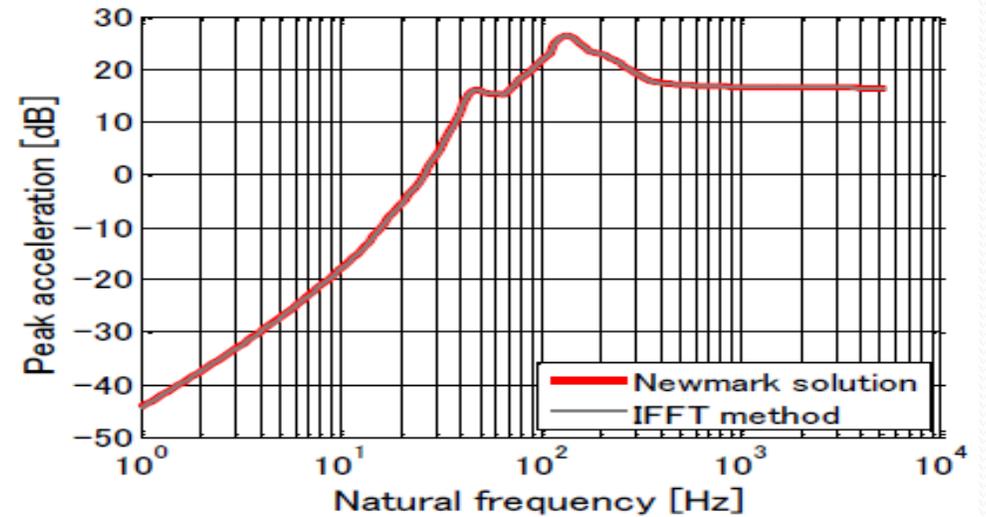
The Problem

- Main goal has changed
  - Modeling program to determine test parameters
    - Removes need for trial and error style testing
  - Analytical models (FEM) can dictate which fixture to use
    - Manipulate the dynamic system with varied mass values
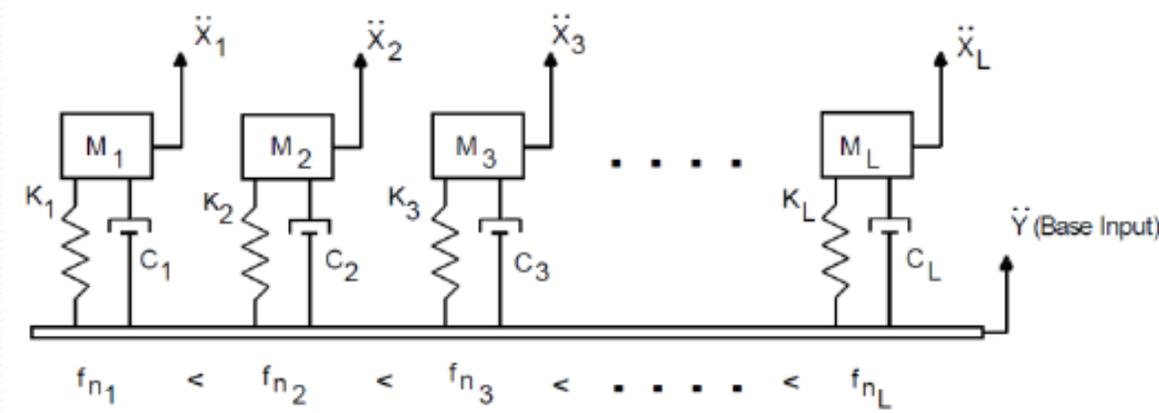
Challenges

- MATLab
  - All group members intermediate
  - C or C++ looks more viable
- Matching SRS curves
  - Math behind the creation of the curves
    - 6DOF Dynamic System
    - Simplified by fixing masses together
    - Tolerance bands set by NASA & MILSpec are tight.
    - Complex mathematical solutions require FEM and extensive testing
      - More data provides more comparisons for accuracy
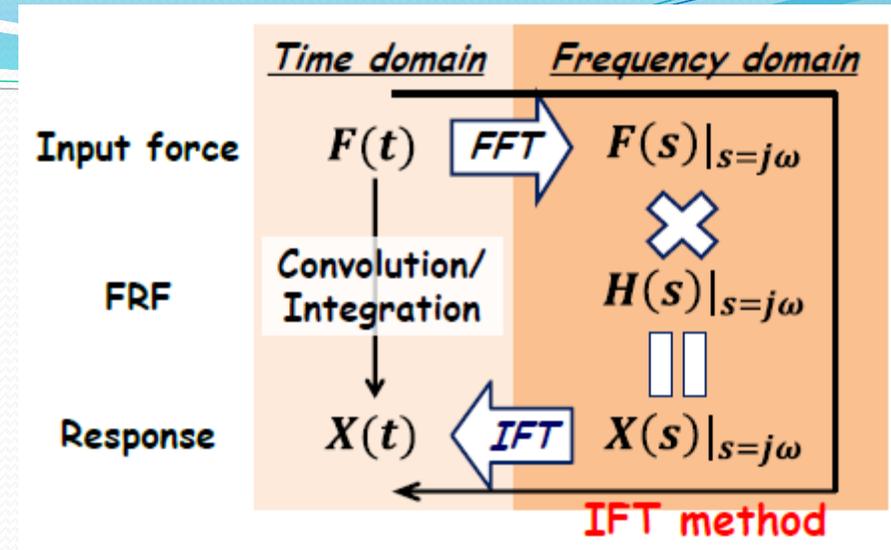
Where to?

- Requesting sample test results from Mr. Wells
  - Expected Output
    - Comparison data (actual vs. ideal)
  - Sample SRS curves
    - Curve matching
    - Solidify grasp on curve tailoring
    - Magnitude of pulse generation and effect on outcome
- Develop test rig to generate data
  - Drop Table
  - Shock Tube
  - Pneumatic Hammer

Schedule

1.3	◢ Brainstorming	14 days	10/6/14	10/23/14		
1.3.1	Pulse Generation	7 days	10/6/14	10/13/14	Chad	
1.3.2	Measurement Methods	13 days	10/8/14	10/23/14	Chase	
1.3.3	Scheduling	7 days	10/6/14	10/14/14	Charles	
1.3.4	Current Method Demo	0 days	10/21/14	10/21/14	Sponsor,All	
1.4	◢ Development	14 days	10/24/14	11/12/14		
1.4.1	Testing Apparatus	5 days	10/24/14	10/29/14	Chase,Nathan	
1.4.1.1	Dimension & Physical setup	5 days	10/28/14	11/3/14	Chase,Nathan	
1.4.1.2	Material Selection	9 days	11/1/14	11/12/14	Charles	
1.4.1.4	Resonance Response	9 days	11/2/14	11/12/14	Chad	

Charles DeMartino
Pyroshock Midterm I
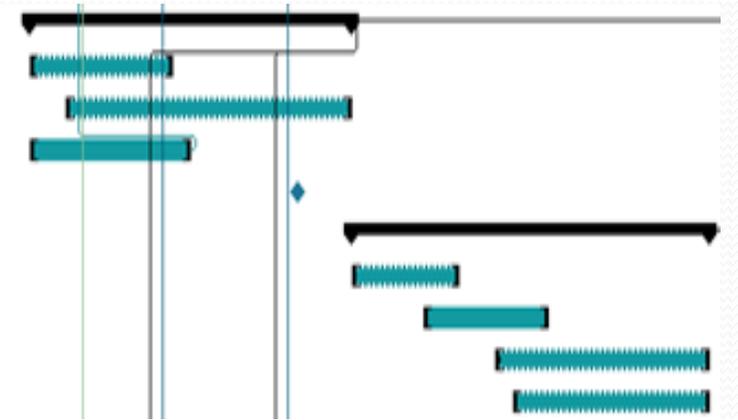
Summary

- From full build to focus on model
- Force generation
- Data acquisition
- Data translation
- Begin CAD design for scaled test rig
- Preliminary programming
  - Pseudocode
  - Flow Chart

References

[1] Wells, Robert. "Conference Call with Robert Wells." Telephone interview. 24 Sept. 2014.

[2] Wells, Robert. "Additional Pyroshock Info." E-mail correspondence. 01 Oct 2014.

[3]Aizawa, Kai, and Peter Avitabile. Shock Respnse Fixture Development and Customization. CAMAL, Chuo University, SDASL, UMASS Lowell., n.d. Web. 3 Oct. 2014.

[4]Lansmont Shock Machine P122L OS. Long Shock." YouTube. Ed. Anton Bakastov. YouTube, 31 Jan. 2012. Web. 13 Oct. 2014.

[5]USA. Department of Defense. Defense Technical Information Center. Pyroshock. Springfield, VA: D.o.D, Print.