Long Distance Transport Analysis for an Ignition Experiment Capsule Fill Tube Assembly (CFTA)

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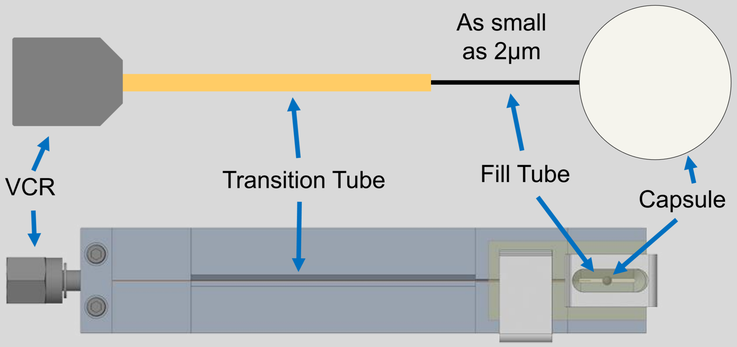
Capsule Fill Tube Assembly Scheduled Shipping

Motivation

- The CFTA is the heart of an ignition target and a CFTAs survival from one facility to another is critical.

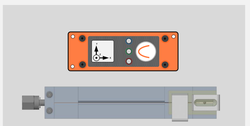


CFTA mounted in an aluminum cradle

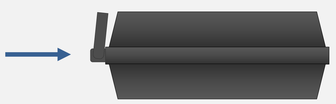
- Failures during redundant incoming inspection
- Identify the largest risk factors during CFTA transport to inform procedure and mitigate these factors.

Ensuring CFTA survival is critical to the mission of the National Ignition Facility

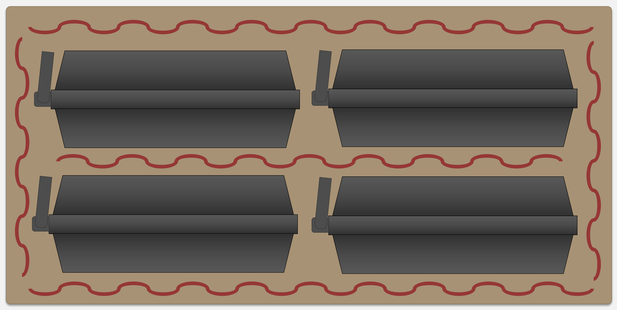
CTFAs and Accelerometer Packaging (1kHz Sampling Rate)



CFTA & Accelerometer



Foam Lined Hard Shell CFTA Case



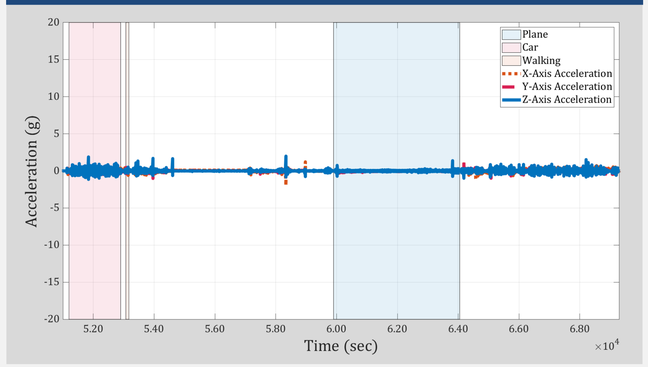
Cardboard & Bubble Wrap

Standard Packaged CFTA Shipment

Analysis needed to rule out transport as a root cause of failure

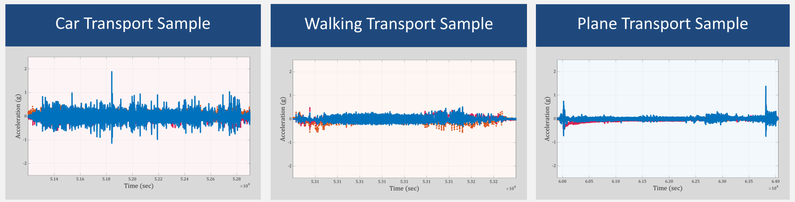
Standard CFTA Transport Process

CFTA Transport – San Diego to Livermore



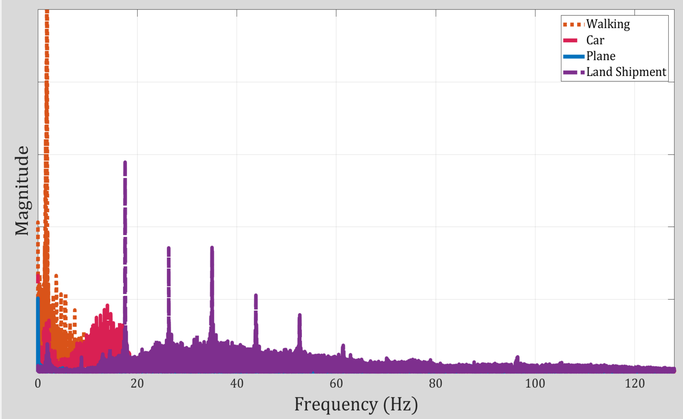
- Transport for CFTAs includes:
  - —Walking
  - —Driving
  - —Flight
- Concerns
  - —TSA handling
  - —Plane take-off and landing
  - —Courier handling

Transport Data Analysis



- FFT on modes of transport identifies prominent frequencies
- Resulting frequency spectrum doesn't provide insight to damage

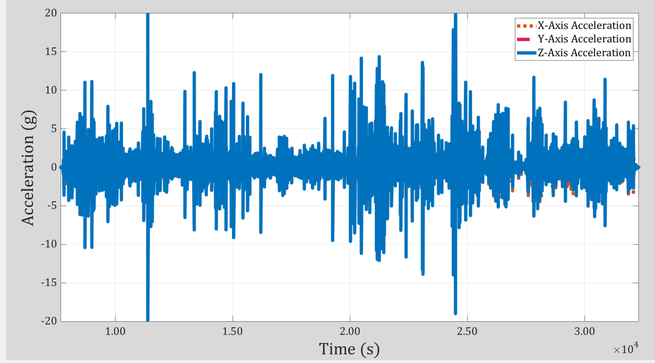
Z-Axis Frequency Spectrum by Transport Mode



Velocity determines energy which informs failure risk

Alternative Shipment Mode

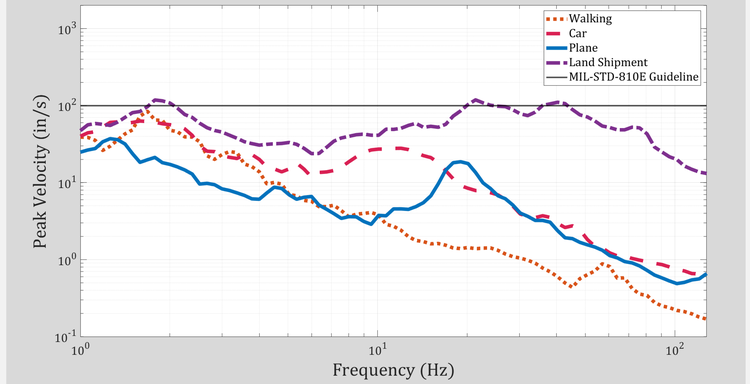
Direct Land Shipping – 30g Impact Events



- Shipped through commercial land transport designed for fragile materials
  - —Standard CFTA package placed in a foam lined container, palletized in a 52ft trailer

Conclusion and Future Work

Z-Axis Pseudo Velocity by Transport Mode



- Pseudo velocity describes the peak velocity of a system with applied signal and modal frequency
- Potential damage to the current CFTA shipment is limited by the energy imparted by walking

Current transport method does not pose risk to CFTA integrity under available metrics

Future Work

- Determine if MIL-STD-810E guideline of 100 in./sec. is an appropriate metric for an ignition CFTA
- Investigate the natural frequencies of a CFTA as packaged for shipment
- Evaluate current CFTA packaging for improvements that mitigate frequencies

P867768

LLNL-POST-867768

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This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.