



NASA STTR 2014 Phase I Solicitation

T12.01 High Fidelity Predictions for Spacecraft and Launch Vehicle Vibroacoustic Environments and Coupling

Lead Center: LaRC

Participating Center(s): MSFC, SSC

Fully verified and validated physics-based methods are desired to predict aero-acoustic and buffet loads experienced by launch vehicles and the resulting structural response. Prediction improvements in both the external environments and transmitted internal vibration are needed to better design lighter and cheaper spacecraft and launch vehicle structure as well as lower costs associated with ruggedizing and qualifying spacecraft and launch vehicle secondary structures. New methods are needed to improve environment predictions in terms of absolute levels, spatial definition including cross-spectra, and associated dispersions. Innovations in the following specific areas are solicited:

- Fundamental physics based CFD predictions of the flow over compression and expansions corners and protuberances and the resulting fluctuating pressure loads.
- Wind tunnel and/or flight tests to provide validation data of the cross spectra dynamic loads for the above problem areas and for the influence of protuberance disturbed pressure fields on vibration.
- Innovative approaches to measure full spectrum surface loads over broad areas to 8kHz full scale.
- New techniques to measure and predict rocket plume-induced fluctuating pressure loads.
- Concepts to accurately and efficiently couple these loads to realistic launch vehicle structures.
- Improved deterministic and statistical modeling of the loads and resulting vibration and transmission.
- Improved integration of vibro-acoustic design criteria into early structural design to provide more effective trade-off studies.