Spacecraft Acoustic Testing Seminar

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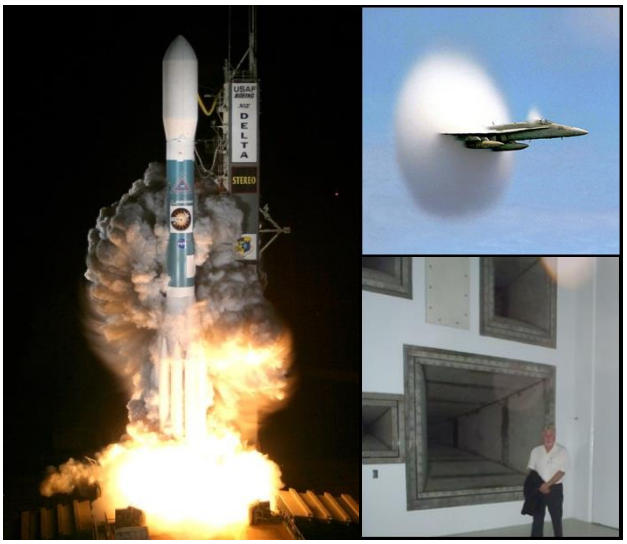
2 Days



One of the major design challenges on many spacecraft is addressing the structural response to acoustic loads coming from launch vehicle rocket motors and aerodynamic effects. Spacecraft and payloads can be damaged or suffer performance degradation due to these loads.

This course is designed for engineers, test personnel and managers who want to improve their understanding of vibroacoustic phenomena, testing techniques and prediction methods. The emphasis of the course is on the logical flow from the measurement or estimation of the launch vehicle acoustic environment through to having a spacecraft that is fully qualified and acceptance tested for flight. A flash memory drive is provided which contains PDF files of the course slides and useful estimation spreadsheets. Hyperlinks are embedded in the course slides which link to the related reference material or to outside web resources.

1. Introduction & Outline
- Overall flow of processes and activities
- Launch and flight acoustics considerations

2. Acoustic Sound Pressure Theory and Terminology
- Sound pressure measurement
- Propagation, reflection and absorbsion and properties of sound waves

3. Launch and Flight Acoustics
- Sources of sound pressure, acoustic events during launch and ascent, measurement of flight acoustic environments
- Estimation of acoustic test spectra based on measured launch data and ground testing

4. Types of Spacecraft Acoustic Testing
- Reverberant Acoustic Testing
- Direct Field Acoustic Testing

5. Acoustic Test Technical Parameters
- Sound pressure level, frequency bandwidth, damping
- Coupling loss factors and reverberation time

6. Acoustic Test Facility Design
- Chambers, vaporizers, horns, transducers, speakers
- Fill effects, instrumentation, modal density
- Communications, Safety

7. System Level Spacecraft Acoustic Test
- Acoustic testing philosophies, methods and requirements
- Test control, data processing
- Test management, personnel, test plans, specifications, procedures and reports.
- Sources of errors in spacecraft acoustic testing and error mitigation

8. Avoiding Acoustics-Caused Problems
- How spacecraft modes respond to acoustic environments.
- Avoiding problems caused by vibro-acoustic responses during ground testing
- Differences between launch/flight and test acoustics.
- Acoustic problems generated during spacecraft launch and ascent