

Spacecraft Environments Seminars

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2 Days

Environmental forces, whether natural or induced, produce mechanical and thermal loading on the launch vehicle and spacecraft. Early in the development of any launch vehicle or spacecraft, these loads must be estimated and incorporated into the design, analysis and test programs. Environmental specifications are the basis for test levels which are used to verify the design and workmanship of a spacecraft.

The course provides participants with the necessary background and tools to produce a set of environmental specifications and test levels for a spacecraft program. Emphasis is on how to progress from the measurement or analytical estimation of the launch or on-orbit environment to a specification that can be incorporated into the spacecraft test verification program. The course is also ideal for managers and system engineers wishing to gain a good understanding of how spacecraft environments and resulting requirements creep can impact their program risk.

Flash drives are provided containing 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

2. Environmental Loads and Sources

Discussion of all processing & flight events that have the possibility of producing environmental loads for either the launch vehicle, spacecraft, subsystems or components

3. Spacecraft Environmental Test Criteria and Standards Detailed discussion of Military, NASA, European Space Agency & Launch Vehicle Standards and documentation

4. Thermal Environments Sources of thermal loads during ground operations, launch, ascent and on-orbit as well as thermal model temperature predictions, test levels and methods

5. Pressure Venting Environments Pressure decay during ascent, an overview of pressure differential analysis & discussion of pressure profile testing

6. Acoustic Environments Sources of acoustic loads, flight data measurement & processing, derivation of test levels & durations, test methods & facilities

7. Acceleration Loads & Environments Sources of acceleration loads, flight data measurement & processing, derivation of test levels, test methods and facilities

8. Vibration Environments Sources of vibration loads, flight data measurement & processing, derivation of component & system test levels & durations, test methods & facilities

9. Shock Environments Sources of shock loads, flight data measurement & processing, derivation of test levels, assessment of shock severity & component sensitivity, test methods & facilities

10. Additional Considerations Environmental Requirements Documents, Conservatism vs. cost & schedule, organizational interactions