

NASA ACADEMY OF AEROSPACE QUALITY

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AAQ Basic Information

<http://aaq.auburn.edu>

AAQ is an internet based forum to provide quality assurance training to students and faculty at all educational levels from K-12 through higher education involved in planning, designing, building, launching and operating payload projects for space. These include **Cube Sats, Small Sats, International Space Station, high altitude balloons, rockets**, and more. The AAQ curriculum comprises interactive, multi-media educational modules for all aspects of quality assurance necessary to ensure mission success including the capacity to customize and store on line quality assurance plans. AAQ also provides a community for networking and sharing of lessons-learned and case studies, and sponsors annual workshops.

Background

Many educational entities are involved in space bound payloads

These payloads are designed, constructed and tested under diverse conditions and by largely “amateur” teams

AAQ’s goal is to provide assistance in assuring that payloads are “successful” from a quality standpoint

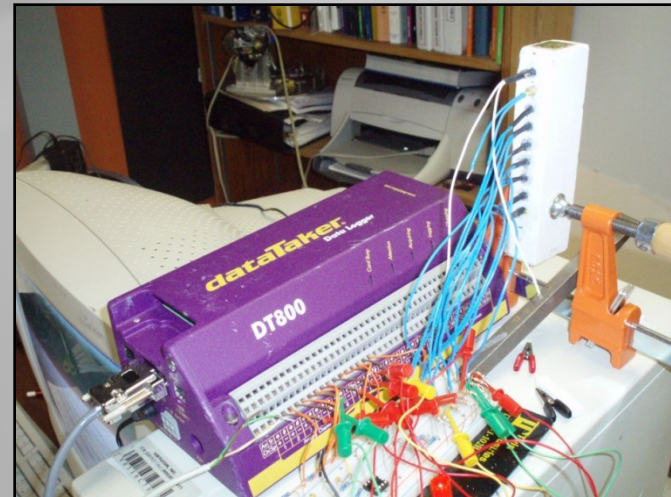


AAQ is for...

Students and faculty involved with payloads – on cube, small and micro satellites, ISS, balloons, rockets, and more

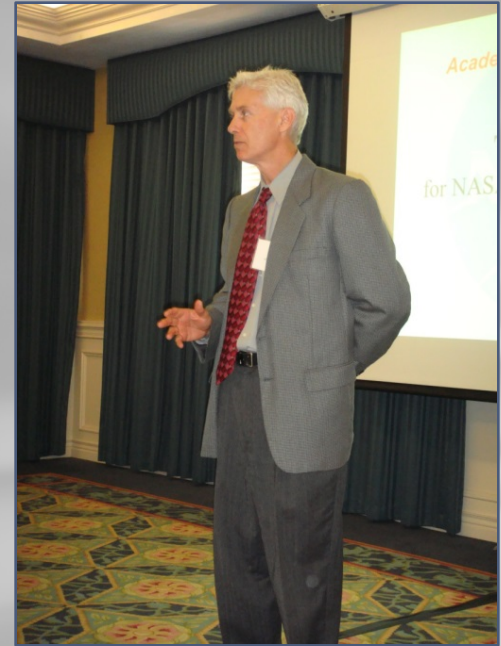
Those interested in becoming involved

Future scientists and engineers interested in space



AAQ Team

- Sponsored and led by NASA Headquarters Office of Safety and Mission Assurance (OSMA) with participation from Marshall and Glenn Space Flight Centers
- Auburn University leads development and deployment
- Expert User Group formed in 2014



AAQ Expert Users

Jonathan Black

- Virginia Tech

Paul Darby

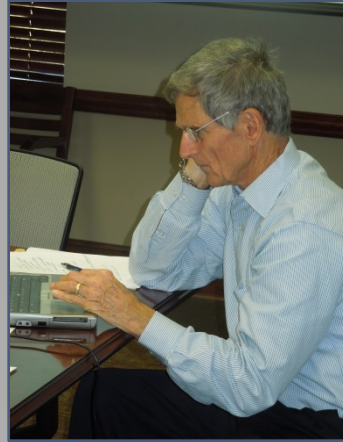
- University of Louisiana – Lafayette

Andy Hollerman

- University of Louisiana – Lafayette

Glenn Lightsey

- Georgia Tech



Iqbal Shareef

- Bradley University

Clayton Smith

- Johns Hopkins University

Francis Wessling

- University of Alabama – Huntsville

Justin Yates

- Texas A&M University



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Educational Modules

- Technical material
- Interactive self quizzes
- Figures and photographs
- Videos
- Links to Standards and supplemental materials

The screenshot shows the NASA Academy of Aerospace Quality (AAQ) website. The header includes the NASA logo, the site name, and a search bar. A navigation menu contains links for Home, Curriculum, Forums, Lessons Learned, Case Studies, References, and AAQ Team. The main content area is titled "Metrology Tutorial" and includes a sidebar with a table of contents: Introduction, Precision and Bias, Measurement and System Evaluation, Statistical Properties, Exercises and Examples, Credits, References, and Standards. The main text area is titled "Standards" and lists several technical standards, including NASA-STD-7009, 48 CFR Part 46, 48 CFR Part 1846, NPJ 8700.1, ANSI/NCISL Z540.1-1994, ANSI/ISO/IEC 17025:2000, and NASA-HDBK-8739.19-2 and -3. A "References" link is at the bottom.

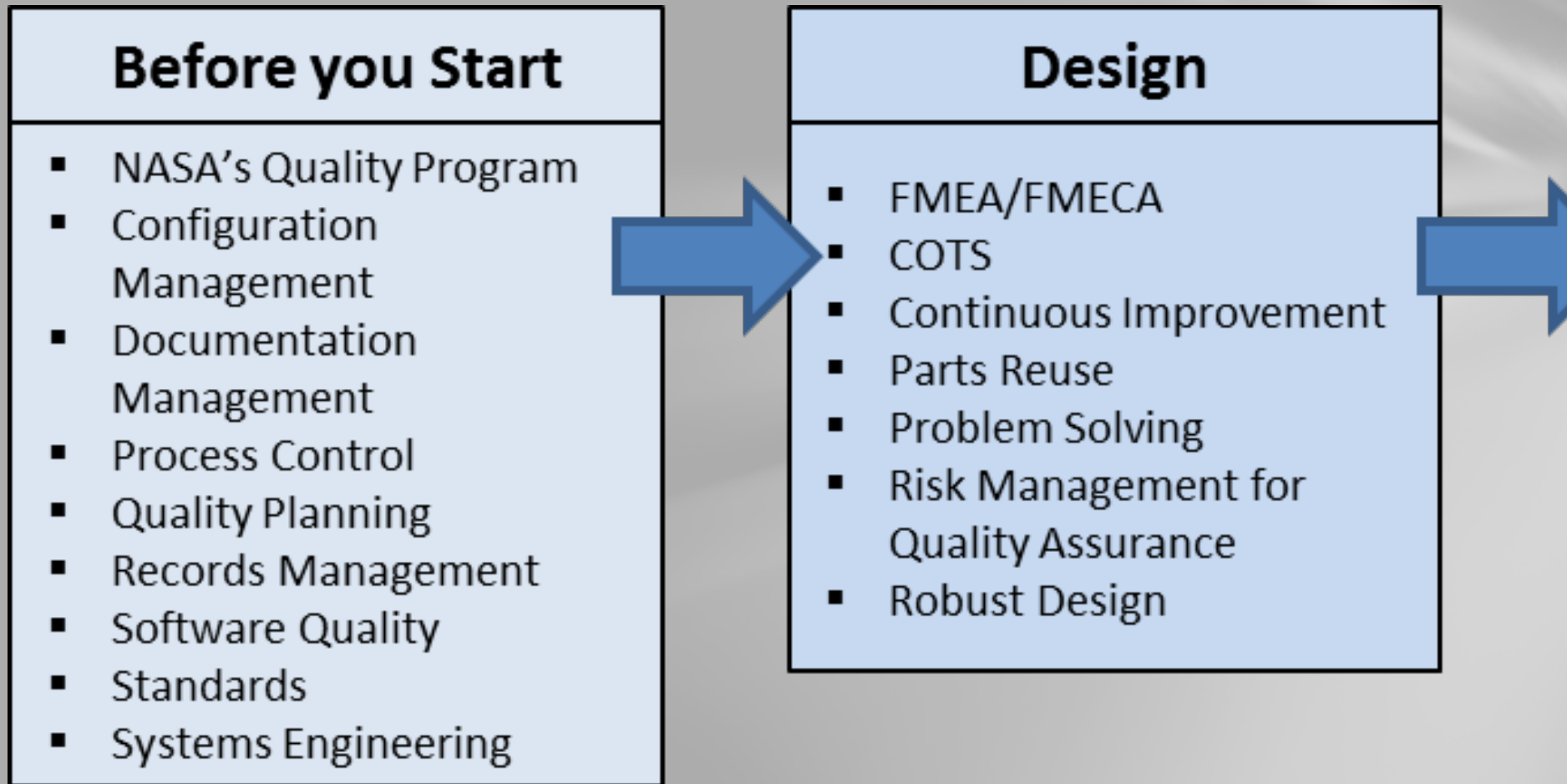
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Solvent	Specification
Denatured Ethyl Alcohol	27 CFR 21.35 Code of Federal Regulations, Title 27, Alcohol, Tobacco, and Firearms, Part 21, Formulas for Denatured Alcohol and, Rum, Subpart D, Specially Denatured Spirits Formulas and Authorized Uses, Formula No. 3-A
Isopropyl Alcohol	TT-1-735
Methyl Alcohol	O-M-232, Grade A
Butyl Alcohol, Secondary	ASTM-D1007

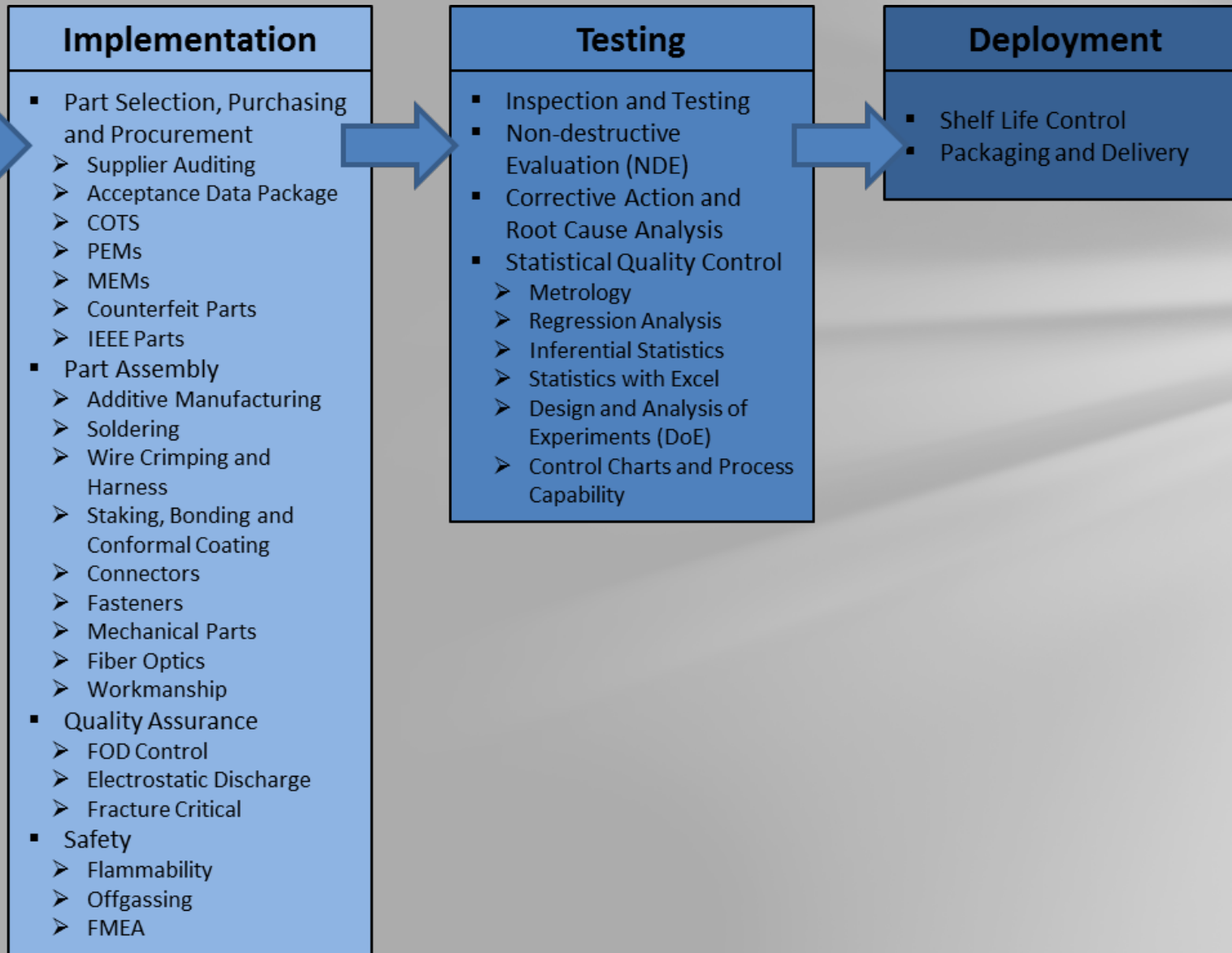
Cleaners	Specification/Note
Water	
Detergent cleansers and saponifiers	1 megohm-cm, minimum resistivity

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AAQ Topic Grouping



AAQ Topic Grouping



AAQ Module Status – Color Code

Stage	Description
Defined	Idea for the module exists. No research/content currently.
Content Collection	Topic is being researched. Content is being collected.
Content Publication	Satisfactory level of content has been collected and is being published to the site, including media.
Module Enhancement	Module quiz, Lessons Learned, glossary, and acronyms links are being added. “Site” aspects of the module are functional at the completion of this stage.
Expert User Testing	Module is being checked by AAQ expert users.
NASA Vetting	Module is being checked by NASA subject matter experts.
Approved	Module is considered ready for public use. Errors/bugs found by users are being remedied. Content updated as necessary.
Needs Revision and Revetting	Approved but needs major revision and revetting.

Current Module Status

2 approved

15 in or ready for expert user testing

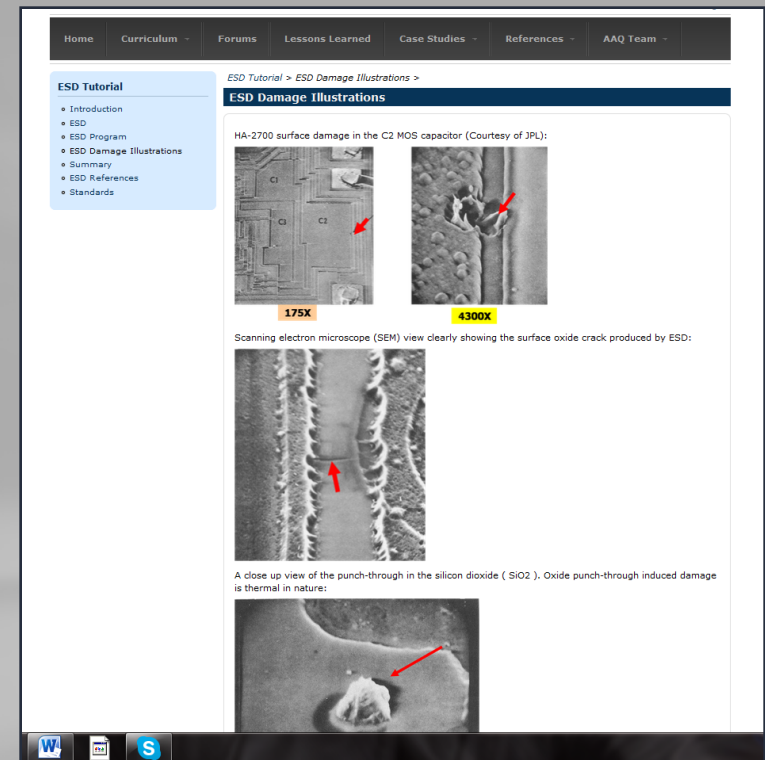
11 in module enhancement

7 in content publication

3 in content collection

7 defined

1 in need of revision and vetting



Home Curriculum Forums Lessons Learned Case Studies References AAQ Team

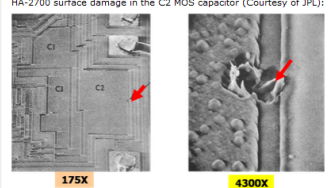
ESD Tutorial

- Introduction
- ESD
- ESD Program
- ESD Damage Illustrations
- Summary
- ESD References
- Standards

ESD Tutorial > ESD Damage Illustrations >

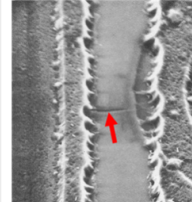
ESD Damage Illustrations

HA-2700 surface damage in the C2 MOS capacitor (Courtesy of JPL):

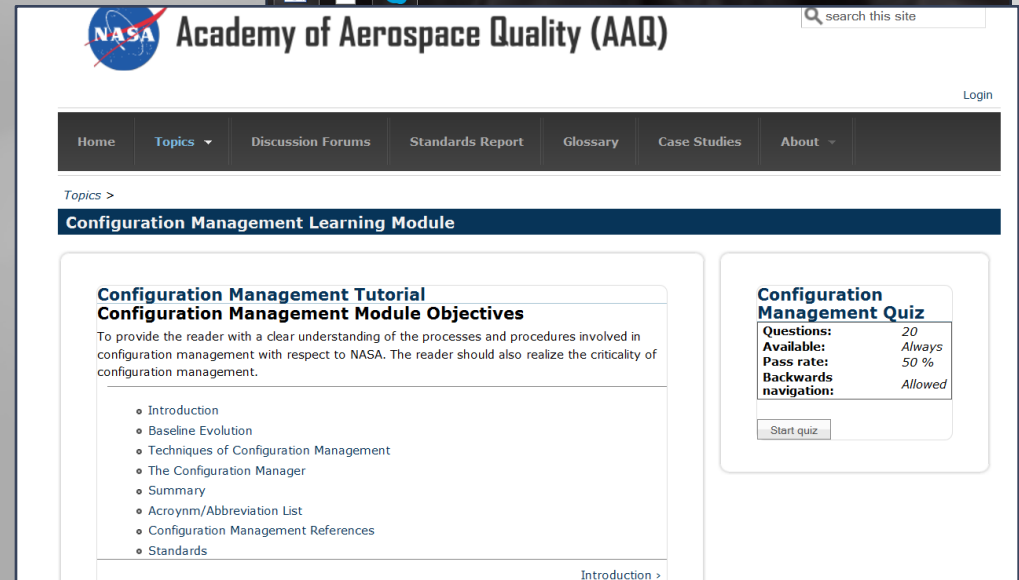



175X 4300X

Scanning electron microscope (SEM) view clearly showing the surface oxide crack produced by ESD:



A close up view of the punch-through in the silicon dioxide (SiO₂). Oxide punch-through induced damage is thermal in nature:



NASA Academy of Aerospace Quality (AAQ) search this site

Home Topics Discussion Forums Standards Report Glossary Case Studies About

Topics >

Configuration Management Learning Module

Configuration Management Tutorial

Configuration Management Module Objectives

To provide the reader with a clear understanding of the processes and procedures involved in configuration management with respect to NASA. The reader should also realize the criticality of configuration management.

- Introduction
- Baseline Evolution
- Techniques of Configuration Management
- The Configuration Manager
- Summary
- Acronym/Abbreviation List
- Configuration Management References
- Standards

Introduction >

Configuration Management Quiz

Questions:	20
Available:	Always
Pass rate:	50 %
Backwards navigation:	Allowed

Start quiz

Other Site Resources


- Interactive Quality Assurance Plans
- 31 Lessons Learned
- 3 Case studies
- Acronyms and definitions
- Links to Standards
- Interactive user forum for posts (Q&A, news)

Case Studies >

Marquette University - Golden Eagle One Cube-Sat

Information regarding Golden Eagle One

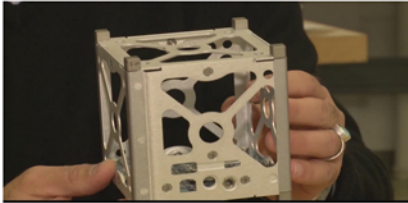
The Golden Eagle One (GE1) CubeSat project is student-led and has a main goal to get students involved in building spacecraft. While the satellite is not quite ready to fly as of June 2014, the near 1 kg cube satellite will primarily be used as an observational satellite, with a main payload of two cameras (one infrared, one visible light). In order to capture and transmit pictures, there are basic components needed on the cube-satellite: solar panels, power regulation, a central computer, and bidirectional communications. On the team, there are two main faculty advisors. In addition, on average there are 20 student members at any given time, but during the summer months it can drop to only around 5 active members.



Marquette University Spacecraft Engineering - Frequently Asked Questions

The future of Golden Eagle One

GE1 has been in development since April of 2011. NASA has chosen GE1 as one of the CubeSats it will launch into orbit. The GE1 team expects a useful mission of 3+ months, with the time being so limited by the commercially available parts that might not be suited for use in space. Currently, the team plans on being ready to fly by Fall of 2015.



CubeSat case close-up

What is the main problem experienced thus far in the project?

W D S

References >

Glossary

Term	Definition	Section	Source
Acoustic Emission (AE)	The phenomenon whereby transient elastic waves are generated by the rapid release of energy from localized sources like places of transient relaxation of stress and strain field.	Non-Destructive Evaluation	
Air ionizer	An air ionizer (or negative ion generator) is a device that uses high voltage to ionize (electrically charge) air molecules.	Counterfeit Parts	en.wikipedia.org/wiki/Air_ionizer
Alphanumeric codes	They classify items in detail.	Shelf Life Control	
ANOVA	Analysis of Variance. It's an alternative method to the classic Gauge R&R analysis.	Metrology	
Antistatic	A compound used for treatment of materials or their surfaces in order to reduce or eliminate buildup of static electricity.	Counterfeit Parts	http://en.wikipedia.org/wiki/Anti-static
Article	A unit of hardware or any portion thereof required by the contract.	Soldering	
Assembly	A functional subdivision of a component, consisting of parts or subassemblies that perform functions necessary for the operation of the component as a whole.	Soldering	
Attribute Analysis	Assessment of a measurement system in which the data are attributes of nominal or ordinal scale.	Metrology	
Axial Lead	Lead wire extending from a component or module body along its longitudinal axis.	Soldering	
Barrier, Fire	An obstruction (such as a partition) that prohibits or tends to inhibit the propagation of burning. May be internal or external in configuration.	Flammability	
Baseline	Technical requirements that are related to cost and schedule and are mature enough to be placed under configuration control.	Configuration Management	
Beam Attenuation	A decrease in light energy from a collimated beam that is passing through a water sample with a specific pathlength. It is an inherent optical property.	Non-Destructive Evaluation	http://www.wetlabs.com/glossary.htm
Beam Spread	The angle of divergence from the central axis of an electromagnetic or acoustic beam as it travels through a material.	Non-Destructive Evaluation	http://www.answers.com/topic/beam-spread
Bias	Bias is the difference between the measurement's average performed by an operator (MA) and a reference value (RV).	Metrology	
Bifurcated (split) Terminal	A terminal with a slot or split opening in which conductors are placed before soldering.	Soldering	
Birdcage	A defect in stranded wire where the strands in the stripped portion between the covering of an insulated conductor and a soldered connection (or an end-tinned lead) have separated from the normal lay	Soldering	

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Quality Assurance Plan

- Customizable, interactive template for project teams
- Can upload files – text, spreadsheet, pictures, etc.
- Permissions granted by project leader (faculty member)
- **Need volunteers to trial this during their payload projects**

Mission Definition

Project Team

Schedule

Training Needs

Budget and Supplies

Design Requirements Management

Configuration Management

Testing and Calibration

Post Mortem

Networked Community of Users

Expert User Advisory Group

Annual AAQ Workshop

- September 1, 2015
- Huntsville
- Travel stipends available
- Look for an email announcement soon!



The Future

Continue module inception, development, trialing, review

Complete and trial interactive Quality Assurance Plan and develop samples/templates

Add case studies and lessons learned

Customize to different categories of users

Add features and modify content according to feedback from the user community – **YOU!**

