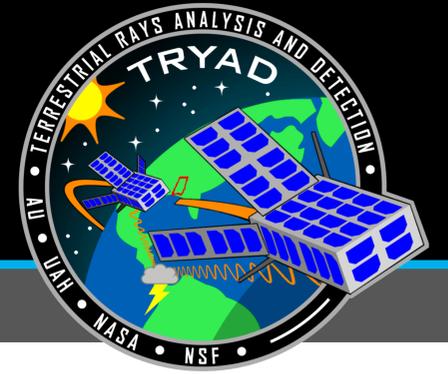# TRYAD: Quality through Continuous Testing

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Systems Engineering Principles

The Systems Engineering Lifecycle follows this principle of drilling down or derivation where design starts broad and drills down into the more complex and smaller units. Then it begins integration where testing and verification starts small and moves onto larger and larger units.

Risk mitigation is the process of identifying risks and issues in the development half and adapting and changing designs to reduce the chance of problems.

Project Lifecycle
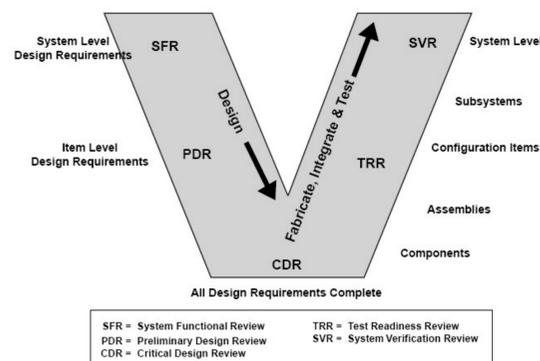
Risk Management/Mitigation

Risks and issues are always present in complicated systems, space systems even more so. The reduction of risks and their effects is a major goal of design teams.

Practically, risks are identified and categorized in weekly meetings where the sole purpose is to solve issues and identify risks. Risks are catalogued by their probability of occurring and their severity and followed up in these weekly meetings. Risk mitigation plans are created to mitigate the risk by reducing its probability of occurring, its severity, or both.

Integrating/Testing Example
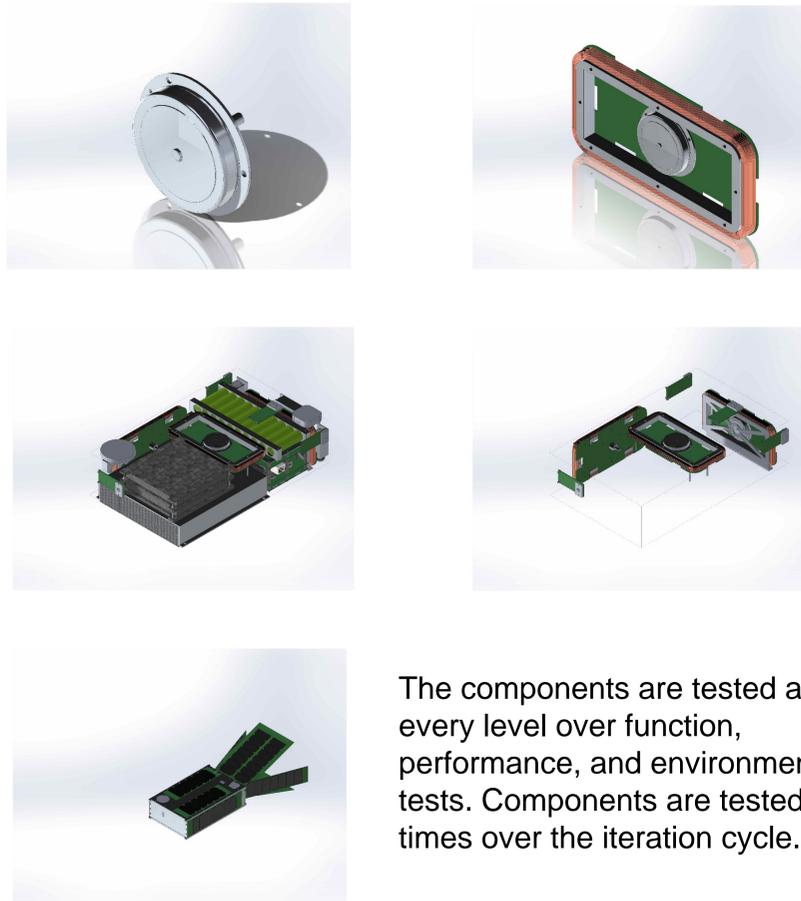
The components are tested at every level over function, performance, and environmental tests. Components are tested 5 times over the iteration cycle.

Risk Mitigation Example

Risk	Probability	Severity	Plan?
Servo Burnout	2	5	Lock panel angles
Reaction wheels fail	3	4	Use magnetorquers

Testing

- By NASA System Engineering guidelines, testing is a complicated and through procedure. There are functional, performance, and environmental tests that must be performed prior to acceptance and launch. The functional and performance tests go hand in hand as the team needs to be sure that the designs will work in space. Environmental tests include outgas testing and vibration testing. These tests ensure that the satellite will survive the launch and space conditions.

- If teams only test once, a false negative result would incorrectly lead teams to assume their designs work and perform well but may fail during use

Conclusion

- All components get tested many times providing the team with assurance that overall system quality is good. Iterative testing also allows for quick analysis and troubleshooting saving time when diagnosing errors or flaws in the system.

- Risk management is an important task that helps increase the chances of a successful mission. Due to the numerous challenges of designing a space system risk management needs to be at the forefront of design and discussed constantly in the context of design alternatives. Practical risk management means making and implementing mitigation plans and constantly reviewing designs for issues and problems.

Works Cited

- V-Diagram: Public Domain, https://commons.wikimedia.org/w/index.php?curid=2109813
- TRYAD Patch: Auburn University Small Satellite Program
- TRYAD Pictures : Auburn University Small Satellite Program