



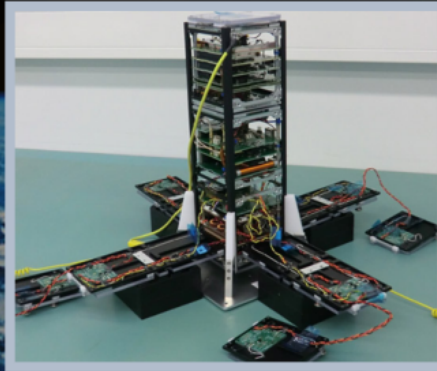
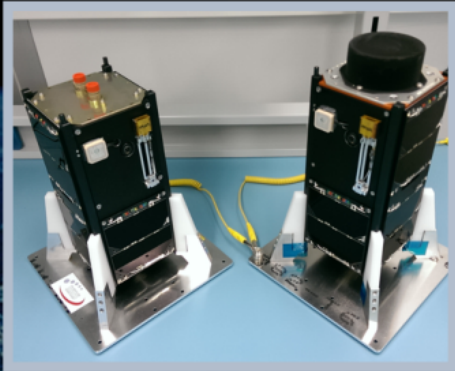
## **Stay on the Path**

**Sticking to your Selected CubeSat Mission  
to Achieve Project Success**



## Innovative Solutions In Space

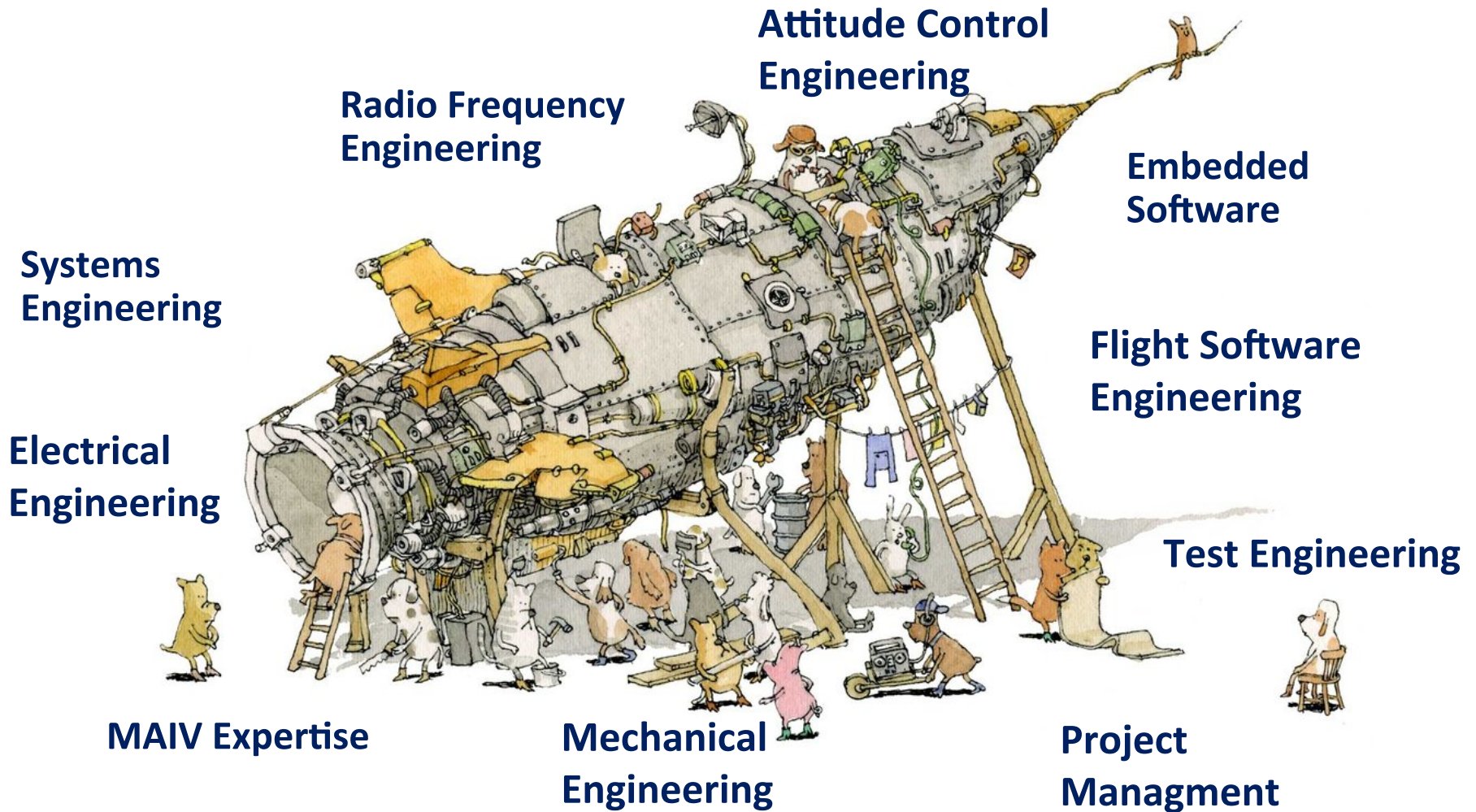
- Small satellite solutions (1 - 25 kg)
- Vertically integrated space company
  - Research and development
  - Components and subsystem production
  - Satellite mission design and implementation
  - Satellite launch services
  - Satellite operations
- 50 FTE based in Delft, The Netherlands







# Fully integrated CubeSat Capability





# Main Activities

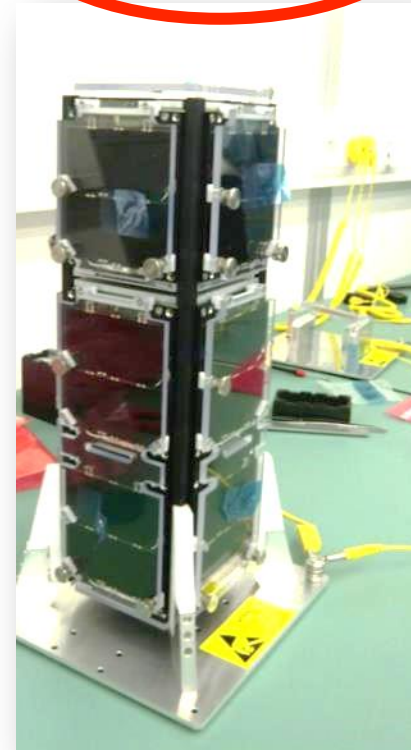
**Standard Products**



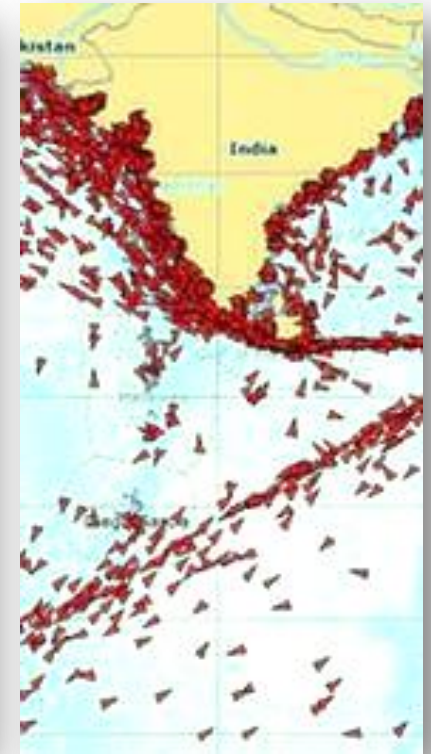
**Launch Services**



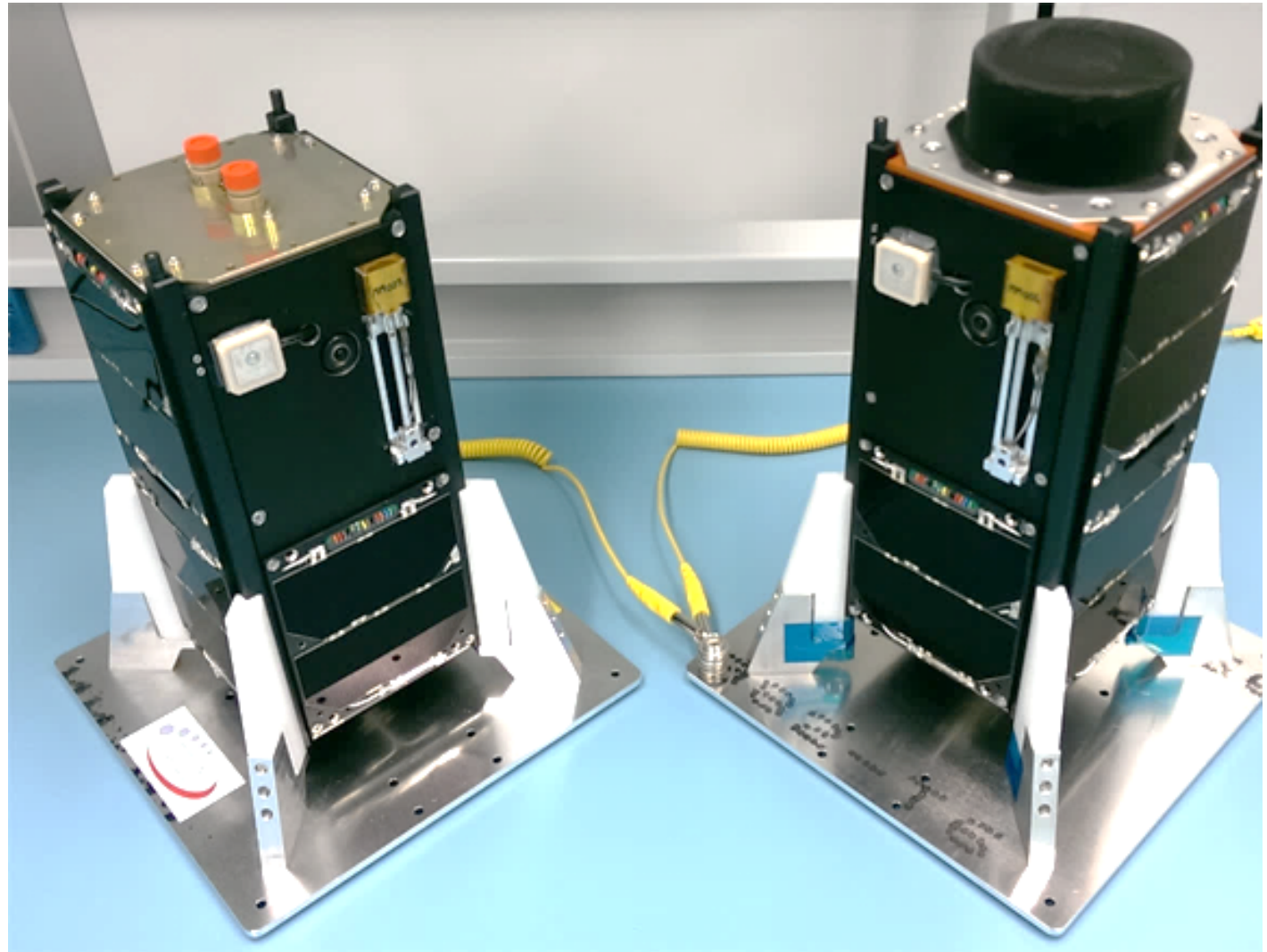
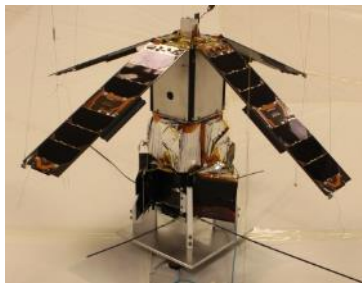
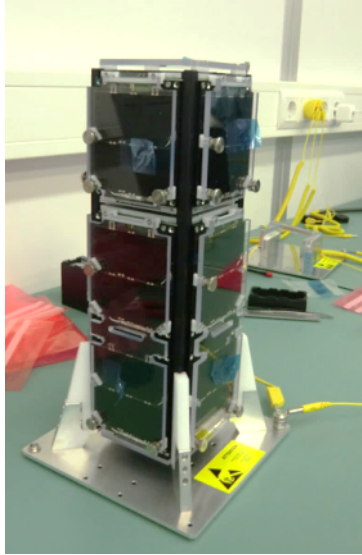
**Missions & systems**



**Networks & Applications**







**CubeSat platforms and turnkey solutions**



# Evolving CubeSat Market

## Changing Applications

- Education
- Tech Demonstration
- Small Scale Science
- Pre-operational Demonstrators
- Medium Scale science (e.g. Radio Astronomy)
- Near-RealTime Global Monitoring
  - Remote Sensing
  - Tracking and Tracing
  - (Space) Weather
- Telecom (M2M, data backhaul)
  
- ISIS works on missions projects over the full application range

## Changing User / Customer Base

- Academia
- Research Groups and SME's
- Space Agencies and LSI's
- Startup companies, and Commercial Ventures based on data services
  
- ISIS supports the full range of CubeSat customers





# Change in design approach

- From a low cost educational tool...  
(anything goes)
- ...to a constraint-based, cost-effective LEO demonstrator...  
(live with its limitations)
- ...to a niche market, full-fledged space solution  
(more classical design approach)

... Large risk of mixing or switching design approaches creating programmatic issues

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**Efficient One-off missions  
are the challenge**

**INDIVIDUALITY**

ALWAYS REMEMBER THAT YOU ARE UNIQUE. JUST LIKE EVERYBODY ELSE.



# The path to mission success?





# The path to mission success?

- The traditional project lifecycle is being challenged due to
  - Shorter project timescales (~6-12 months)
  - Much wider (mixed-experience) customer base
  - broader risk acceptance range
- In the last 9 years, ISIS has gained experience in working with tens of different one-off missions
- And has been involved in many different flight projects with different customers:
  - Universities and research institutes, commercial companies, consortia, etc.
- Each of these projects has their own challenges but they often share a number of common misconceptions, issues and result in programmatic challenges





# Misconceptions – Paperwork is evil





# Misconception – off the shelf Hardware



CubeSatShop.com | [isispace.nl](http://isispace.nl) | [isilaunch.com](http://isilaunch.com)

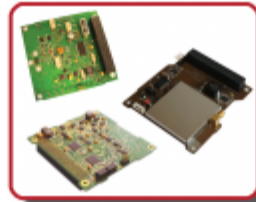
The one-stop-shop for all your CubeSat and nanosat systems...

Welcome to the CubeSatShop, the one stop webshop that offers a broad range of products for CubeSats and nanosatellites in general. The webshop offers standardized, off-the-shelf components and subsystems from a variety of manufacturers.

## Categories



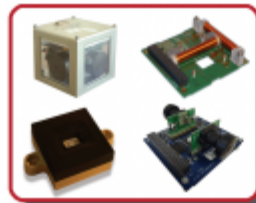
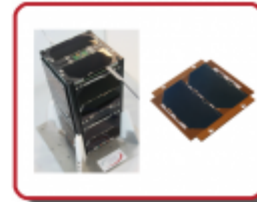
CubeSat Structures



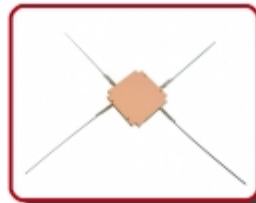
Communication Systems



Power Systems



Attitude Control Systems



Antenna Systems



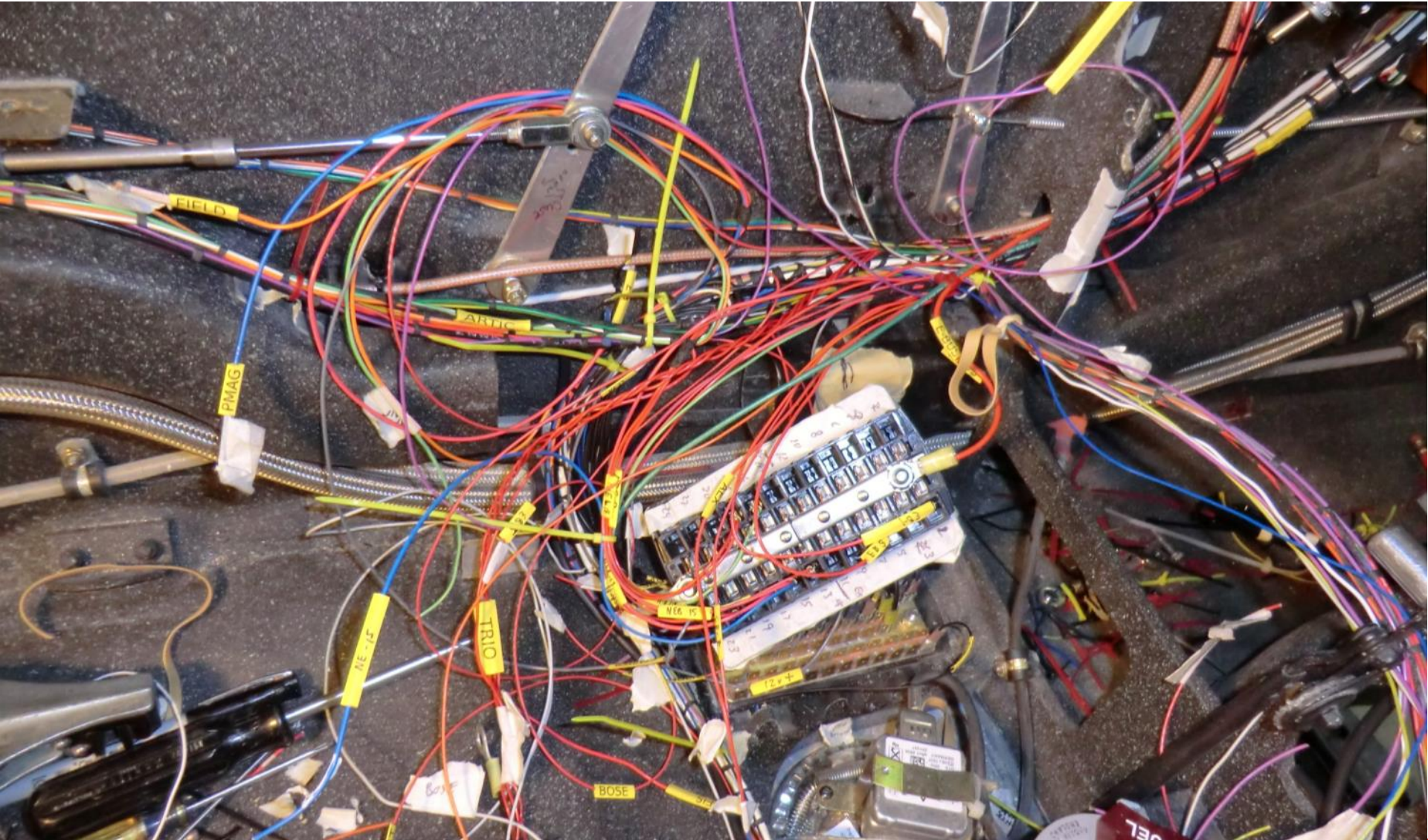
Command & Data Handling







# Misconception – Plug-and-Play





## Misconception – Strict CDS adherence

CubeSats: 1 kg (10x10x10cm) to 25kg (22x22x45)

1U

1.5U

2U

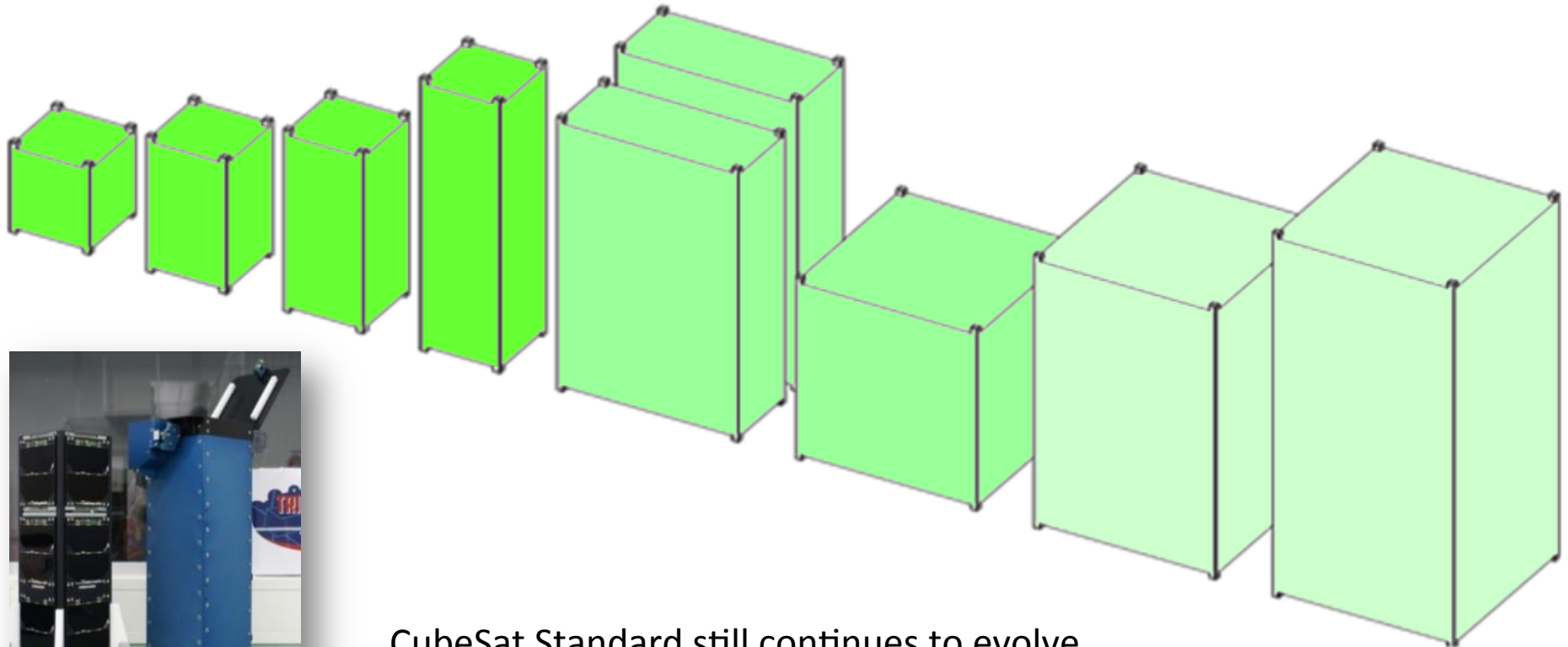
3U

6U

8U

12U

16U



CubeSat Standard still continues to evolve



## Causes for issues – The Customer

"The customer is always right," is half a sentence. The rest of it is, "if the customer is reasonable and not an idiot"



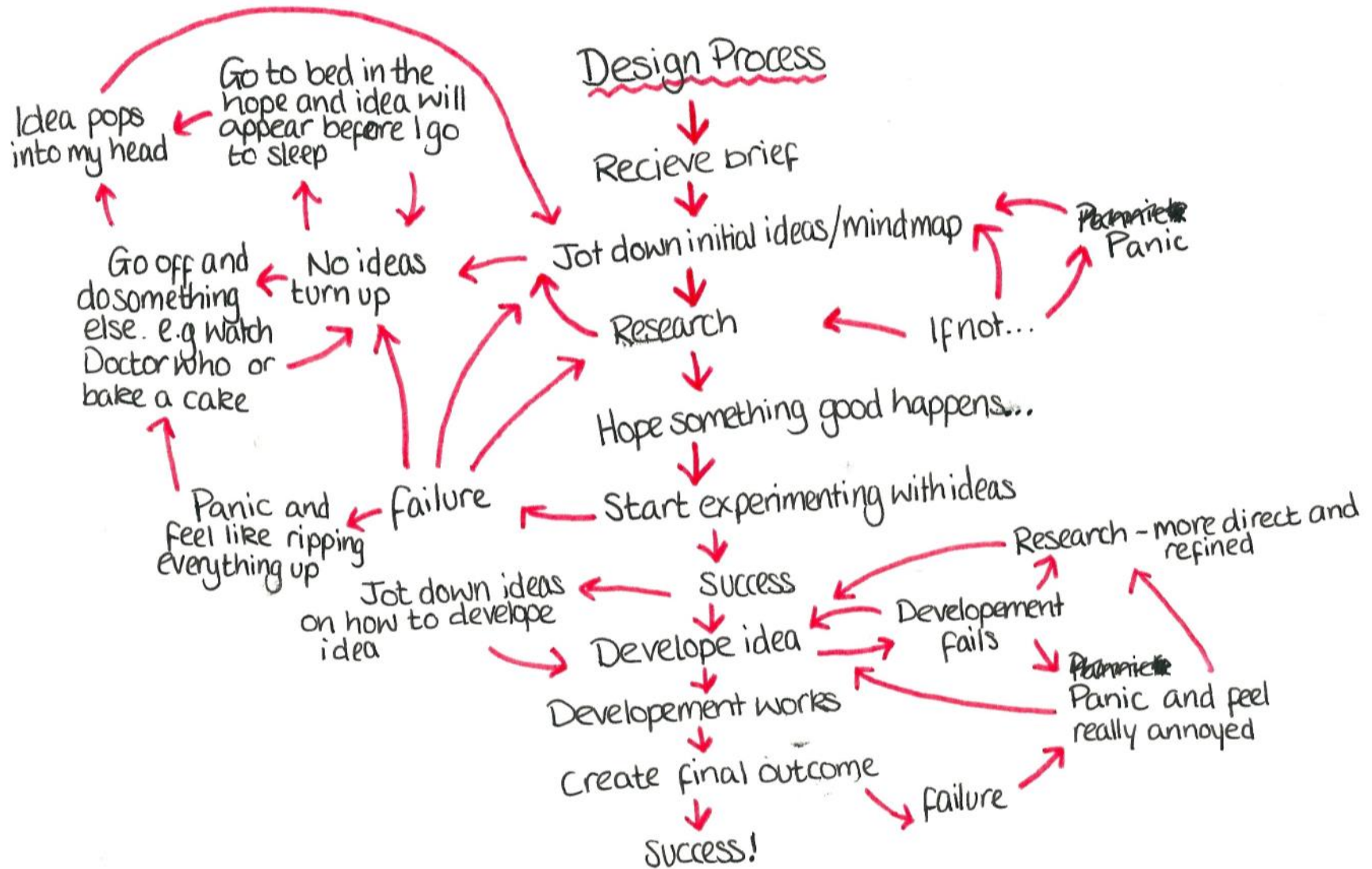




## Causes for issues – The Customer

- Varying customer type
  - Experience Level In Space Missions
  - Subject Matter Expertise
  - Expectations
- Level of involvement varies
  - Mission Objectives and requirements
  - Requirements creep / scope creep
  - Unclear on interface responsibility
- Is also subject to various influences
  - Consortia, sponsors and funding bodies
  - Hidden requirements / constraints

# Causes for issues – process uncertainty





## Causes for issues – process uncertainty

- Funding cycle drives configuration
- Imposed external process
- Requirements creep / scope creep
- Skipping mission definition process
- Review by date , rather than design readiness
- Hidden requirements / constraints





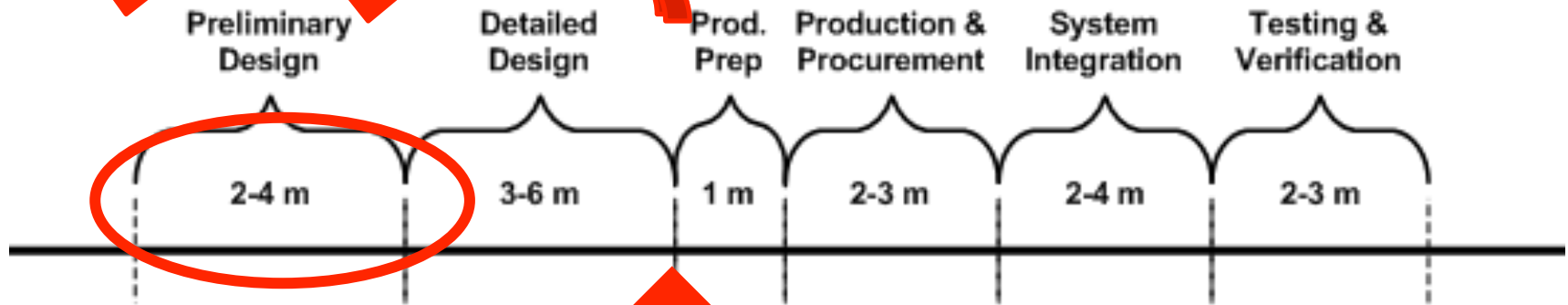
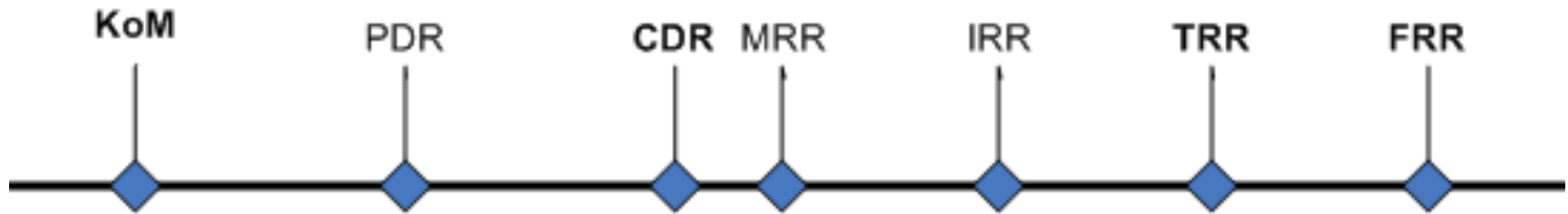
# Common results

- Chaos
- Switching design approaches midway the project
- Redoing work
- Delays
- Cost escalation



# Common CubeSat Design Process

Waiting on new budget or descoping of mission



Skipping the definition phase

New Requirements appear / Things have been missed



# Lessons Learned



- Focus on mission definition and preliminary design
- Don't take too many shortcuts
- Contractual split between design and implementation phase helps
- Plan for the worst case scenario
- Get all requirements and constraints on the table early
- Educate the customer, educate the supplier





# Conclusions

- CubeSat projects do not always use traditional design process
- This causes different issues and different solutions for different projects
- By improving the way these different projects are run, we might actually end up with a process that is more optimal than the traditional process
- But it is important to deliberately choose a certain process and avoid costly pitfalls or changes in design process halfway a project.



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**Visit us at booth #76 at the Smallsat'15 Exhibit**

**Thank you for your attention!**

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