Where to start

- Discussion is location dependent, but some are more equal than others. We want a generic topic. Does country have a space division/ in government. If not first sort this out.
- Set end point/goal at beginning, before even doing design.
- First do rough mission idea (brainstorm with experienced people if possible and simple feasibility of design) to present to company, then try get funding. Appeal to their possible research needs.
- a wiki with quick crash course into. And few links to go deeper into the specific points.
- be cautious not to focus too much on one thing
- learn by doing

Scheduling

- Start with a flexible gannt chart. Do iterations during design as you learn what takes longer.
- availability of testing equipment – be aware of
- COTS components– be aware of places where you source from so do an procurement investigation

Where to find mission-idea

- Find problems in country/society which need solutions. Professors are a good source of possible mission ideas (they have a wealth of knowledge). Use imagination.
- Do research into current and previous missions to find ways to do it better
- Must be a need and somehow address it, remember you want someone to fund this…
- read through previous mission ideas contest booklets

Funding

- Do a campaign, find companies who want publicity, be creative. Tricky to talk to the right people.
- Kickstarter, its still not easy though. Contacts are important to talk to the right people.
- Get multidisciplinary team (obviously not a big team, maybe a friend/student who does marketing and money affairs). This means the engineering team can focus on the engineering team.
- Governmental funding eg QB50 (probably the easiest)
- educational programs

Teaming

- have a diverse team: engineer, PR/funding, software, payload specialist (if scientific mission).
- Have person checking up on other persons work.

- Don’t have a team which is too big (aprox: 5 people). If team is bigger (ex 20 people, assign team managers and project manager.)
- Careful for single point of failure, at least have backup plan if someone leaves.

Regulations

- launch requirements, be aware of these before you start final design.
- groundstation and frequency?
- Be aware of space launch regulations

Design

- think of software at beginning
- have a team review from outside to do give non-biased feedback
- Component list to fullfill requirements, be open to compromise. Have an A, B, C plan etc. Find similar mission and see how they did it. Contact them and ask what they learnt.
- Typical mission contains (note the regulations of launch vehicle etc ef ISS, requirements and timeline of these)
    - Scietific payload
    - EPS
    - solar panel
    - OBC
    - Comms
    - software (think of this as subsystem)
    - Ground station
    - Actual encasing
    - cable management

Procurement

- get components,

Assembling and testing

- assembly
    - clean room? vacuum chamber? Be creative...
- Testing (from regulations and requirements of launchers. See CubeSatShop- have launchers with requirements. See lectures notes. Also look at swisscube methodology)
    - Procedure, testing methodology
    - thermal vacuum
    - power testing
    - vibrations
    - EMC tests
    - How do you certify test? look at industry if they have any machines for this. Collaborate with other Universities?
        - transparent documentation. Pictures and documentation of everything... then you can prove results

Transportation

- Be carefull of anything which may be considered as an explosive
- Or get a private company? Money...

Launch

- possibly do comms tests as close as possible before going to launch site (see regulations again regarding this)
- Note: launch sites usually quite remote. Will have to be there in person (or a representative)
- Ground station guy must be ready and present
- you only may charge and insert the battery at launch site

Post launch

- Must know how long sat must be quiet before starting to transmit. (usually 30mins, see regulations again)
- station keeping, telemetry, determine condition
- plan your operation post launch long before launch

Operation

- be mindfull of possible updates, have design such that this is possible and safe if this is important.
- collect scientific payloads data
- Downlink priority data and have a proper dowlink schedule
- always check condition to properly manage the subsystems
- Regulations may prohibit sending commands via other groundstations, but you may downlink via others.

Post operation

- continuity-start next project after launch or even before
- see if other sensor data is requested.
- deorbit... in design consider this
- NORAD: use this to determine when it doesnt exist anymore
- PR