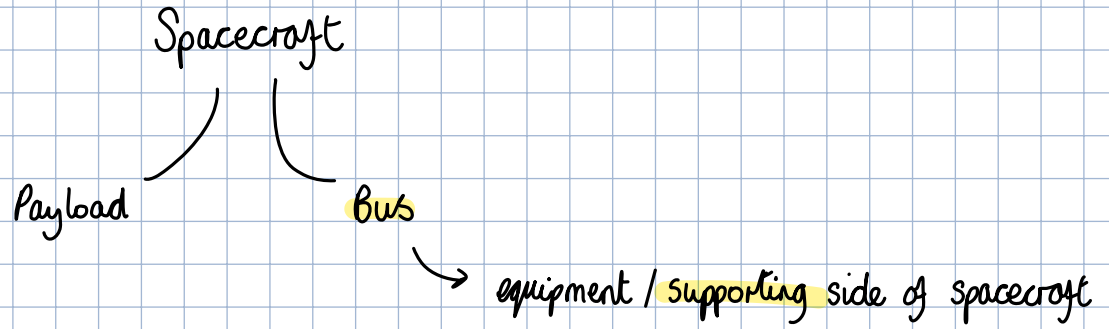
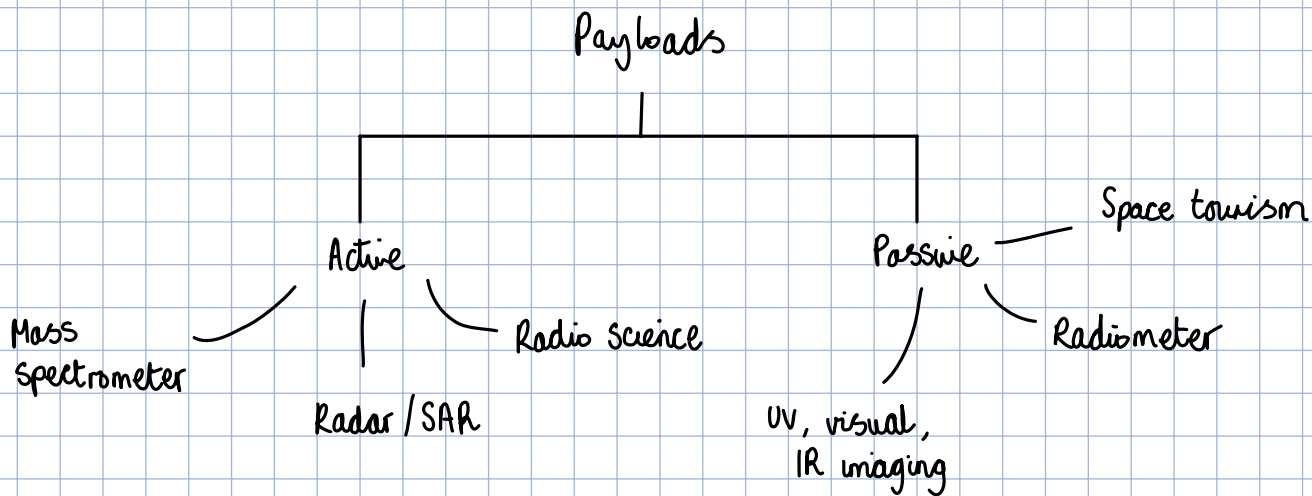
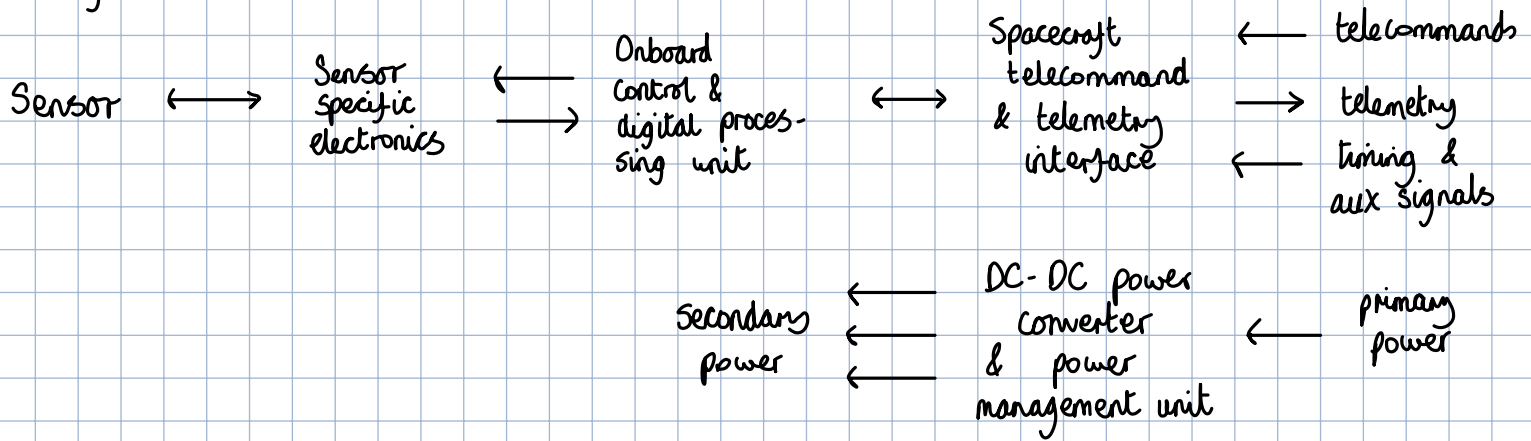


Payload is part that fulfills space mission → most significant design driver most missions.



A generic instrument involves:



Active - provide own means of sensing Subject

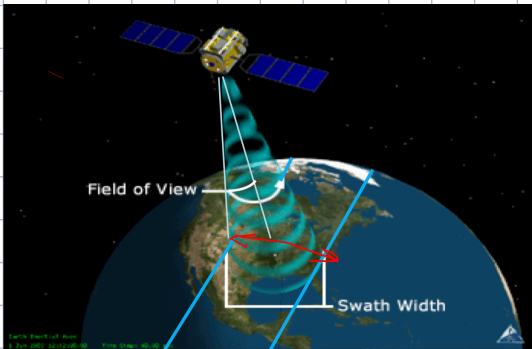
Passive - receive & process data only

Instrument Performance:

1. Storage / transmission of data - memory & link budget for orbit
2. Sensitivity or signal / noise - detector, temp, aperture, link, dwell time, focal length
3. Spectral band
4. Swath Width
5. Field of view
6. Coverage
7. Scanning modes
8. Resolution

3 - Spectral Band : part of EM spec an instrument is using
↳ can combine different spectral bands for most info

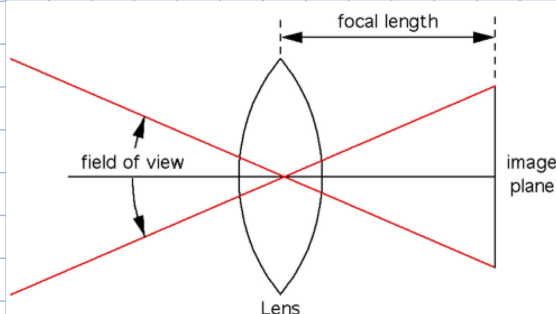
4 - Swath width : swath = path sensor looks at on ground



Swath width = width of path

↳ determined by height of orbit & sensor field of view

5. FoV - angular foV is extent of observable world seen at given moment
↳ dependent on focal length & detector size



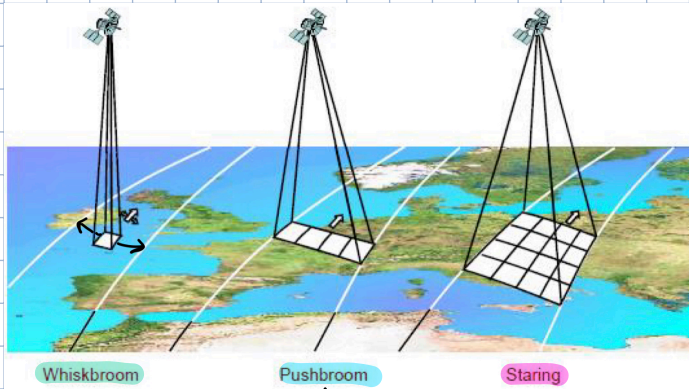
Large detector = Wide FoV

Long focal length = narrow FoV

6. Coverage - total geographic area that satellite can communicate with.

- footprint is what area a satellite can communicate with or observe at one moment in time

7. Scanning Modes



Dwell time : how long satellite remains over specific area of body it's orbiting

uses rotating mirrors to sweep from side to side

simple but mechanical

not favourable

limited dwell time

uses a line of charge-coupled device detectors (CCD)

more dwell time

uses 2D array

even more dwell time

faster frame rates

computationally expensive

8. Types of resolution

Spatial

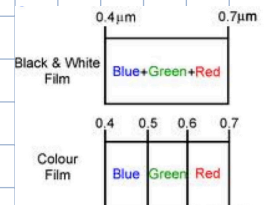
Size of smallest detectable feature (m)

Angular

Smallest feature per unit angle (degrees/arcmins)

Spectral

Ability to define fine λ intervals (nm)
Smaller = narrower range



Radiometric

ability to discriminate very slight differences in energy (bits)

Finer = more sensitive
↑ bits

2 bit



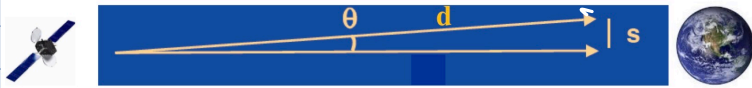
8 bit



Temporal

revisit frequency : time to return to same view of earth (time units)

Spatial or Ground Resolution :



$$s = d \sin \theta$$

$$\sin \theta \approx \theta \text{ for } \theta \ll 1 \text{ rad}$$

Angular Resolution :

Rayleigh Criterion gives $\theta = \frac{1.22 \lambda}{D}$ (in rad)

\nwarrow diameter / aperture

