Mission report of CLTP 8

~~CLTP 8 Team HMT3~~

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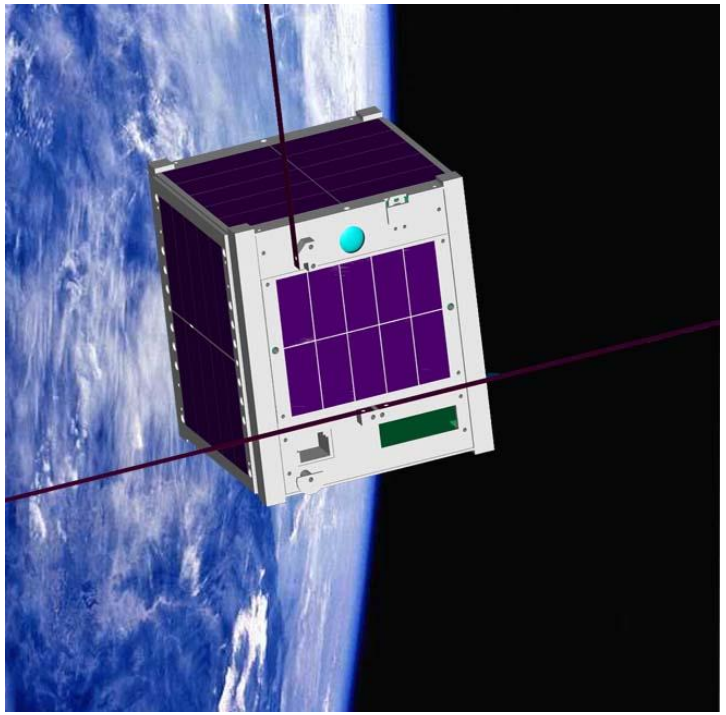
Introduction

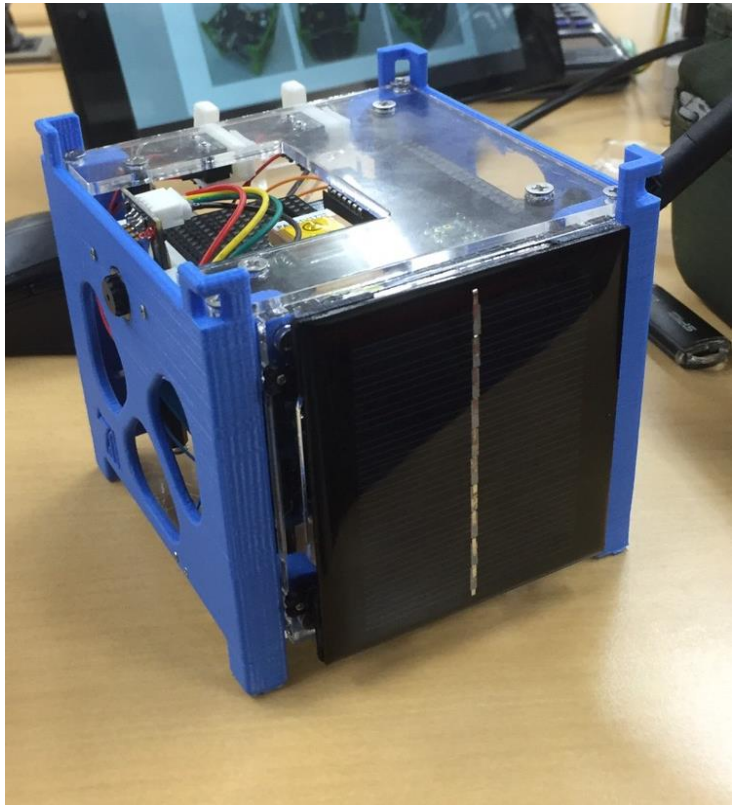
- These days, micro satellite are spreading all over the world.
- The outer structure is very small due to the satellite itself is small.
- We decide to focus to evaluate the strength of outer structure.



Mission statement

- We will search the structure forth ,enough to endure shock at parachute deployment and shock at fall

- We will detect the amount of deformation when it dropped on ground



About experiment

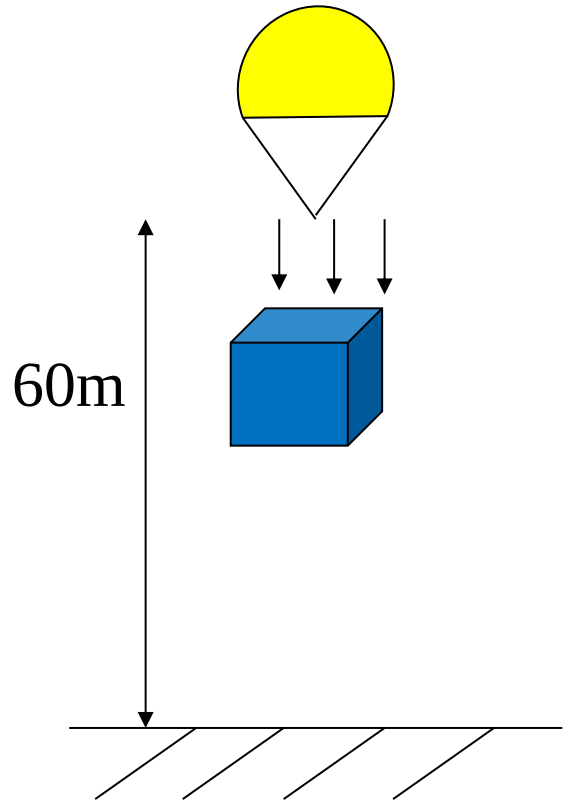
HEPTA-SAT drop on ground from height 60m

↓

What will become the HEPTA-SAT after it dropped impact?

↓

We thought it search to structure forth



About experiment 2

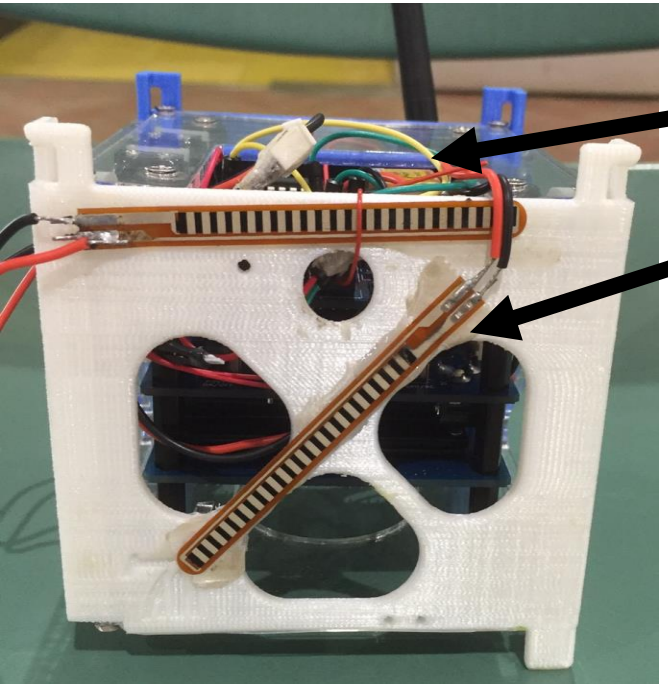
Bend sensor ×3

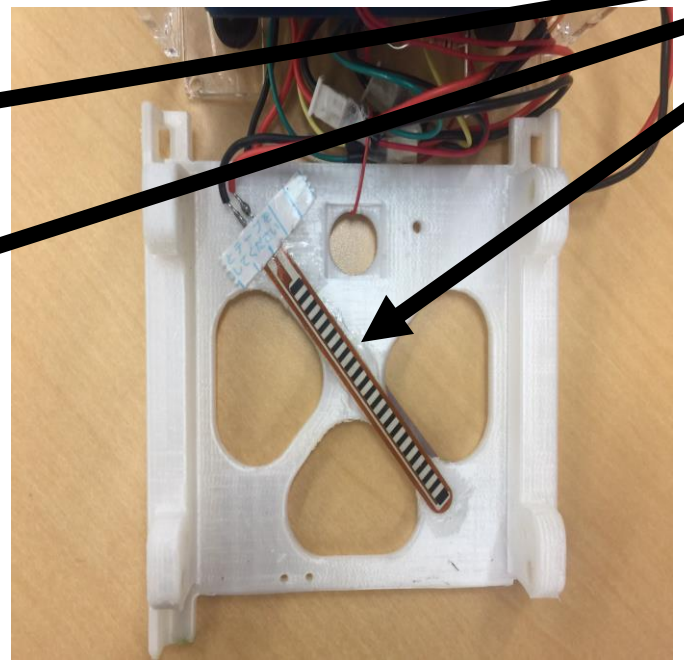
Using the reason・・・HEPTA-SAT bend by known
That structure of force measured .

About the bent sensor

The front

The back





Flexible bent sensor

We use three bent sensor.

While HEPTA-Sat is descending, it will detect the deformation of amount of structure.

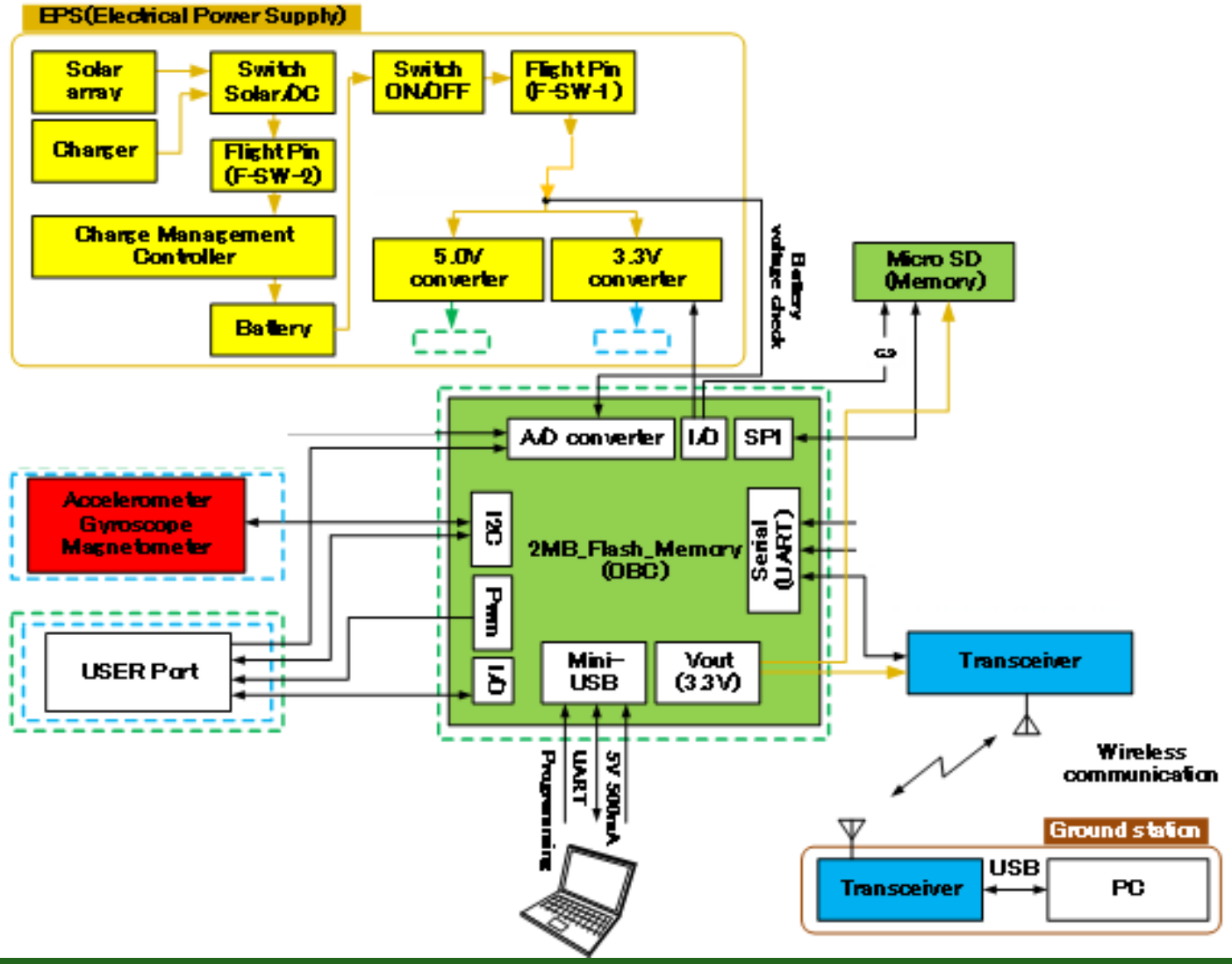
Mission criteria

Minimum success	(1) We get data from one bent sensor
Full Success	(2) We get data from all bent sensor
Extra Success	(3) We finish the analysis of data of bent sensor

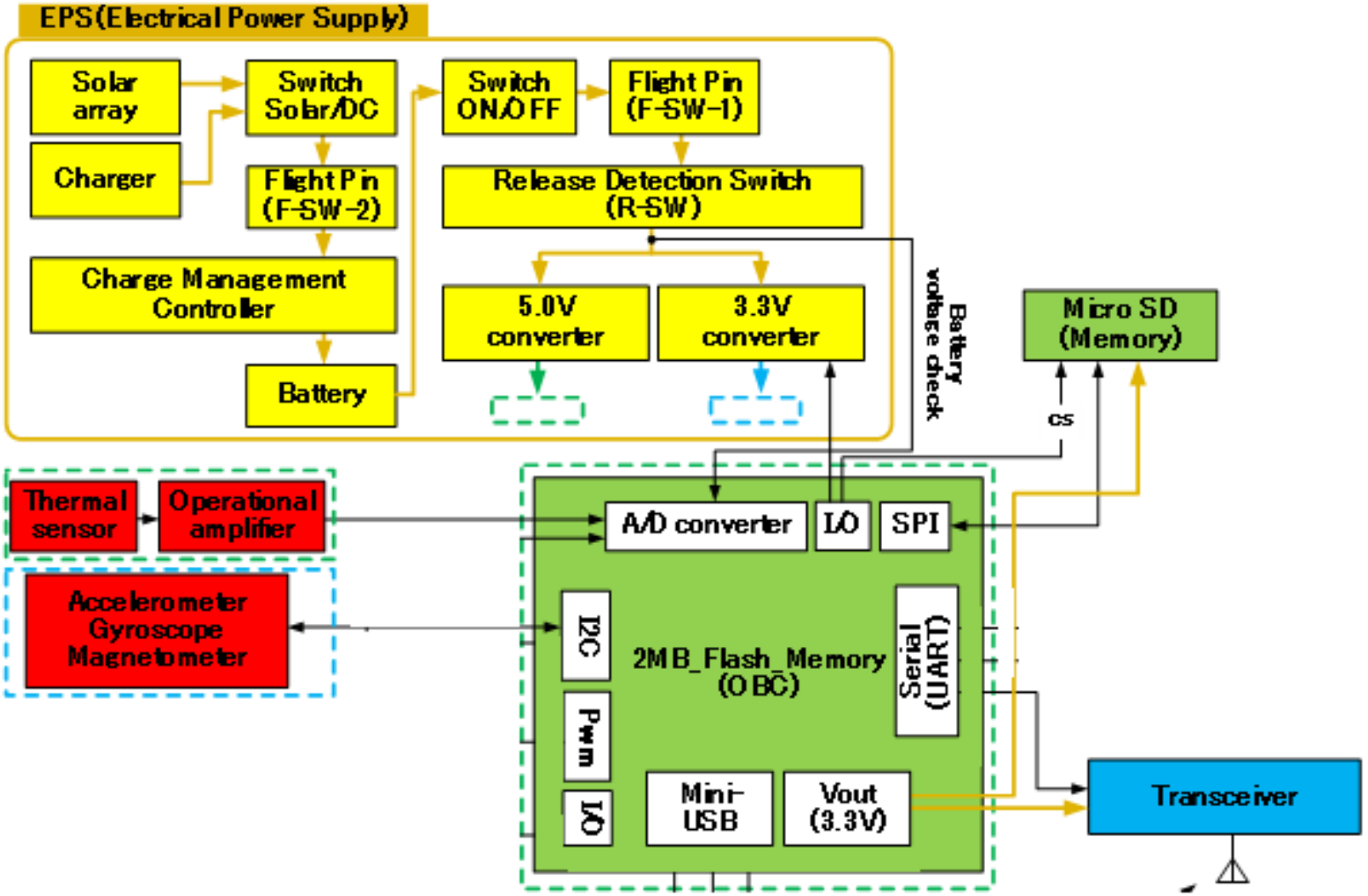
Mission requirement

No	Event	Requirement	Required function	verification way	achivementone time	two times
R-1	Standby time phase	Battery voltage is enogh	battery voltage is more than 4.0v	charge the battery before launch	○	○
		Size is enogh smoll to put in the case ofdrone	smoller than the case		○	○
		hot launch	no flightpin	replace the flightpin	○	○
R-2	Launch phase	Uplink the startcommand toHEPTASAT	crucial transmission by Xbee	Xbee transmission test	○	○
					○	○
					○	○
R-3	mission phase	take a data ofone sensor	bend sensor	sensor system operation	○	x no reaction
		take a data ofthree sensors	bend sensor	sensor system operation	x no reaction	x no reaction
		downlink posture ofHEPTASAT	crucial transmission by Xbee	Xbee transmission test	x cutoff	x cutoff
		downlink sensor values of HEPTASAT	crucial transmission by Xbee	Xbee transmission test	x cutoff	x cutoff
		getvalues from sensors	crucialabionniscs	check the elements one by one	○	○
		enogh decelation	crucialopenning of parachute	parachute opening test	○	○
		save the values to SD card	crucial saving of the values	SD saving test	○	× notreading data
R-4	analysis	change bend sensor from degree				

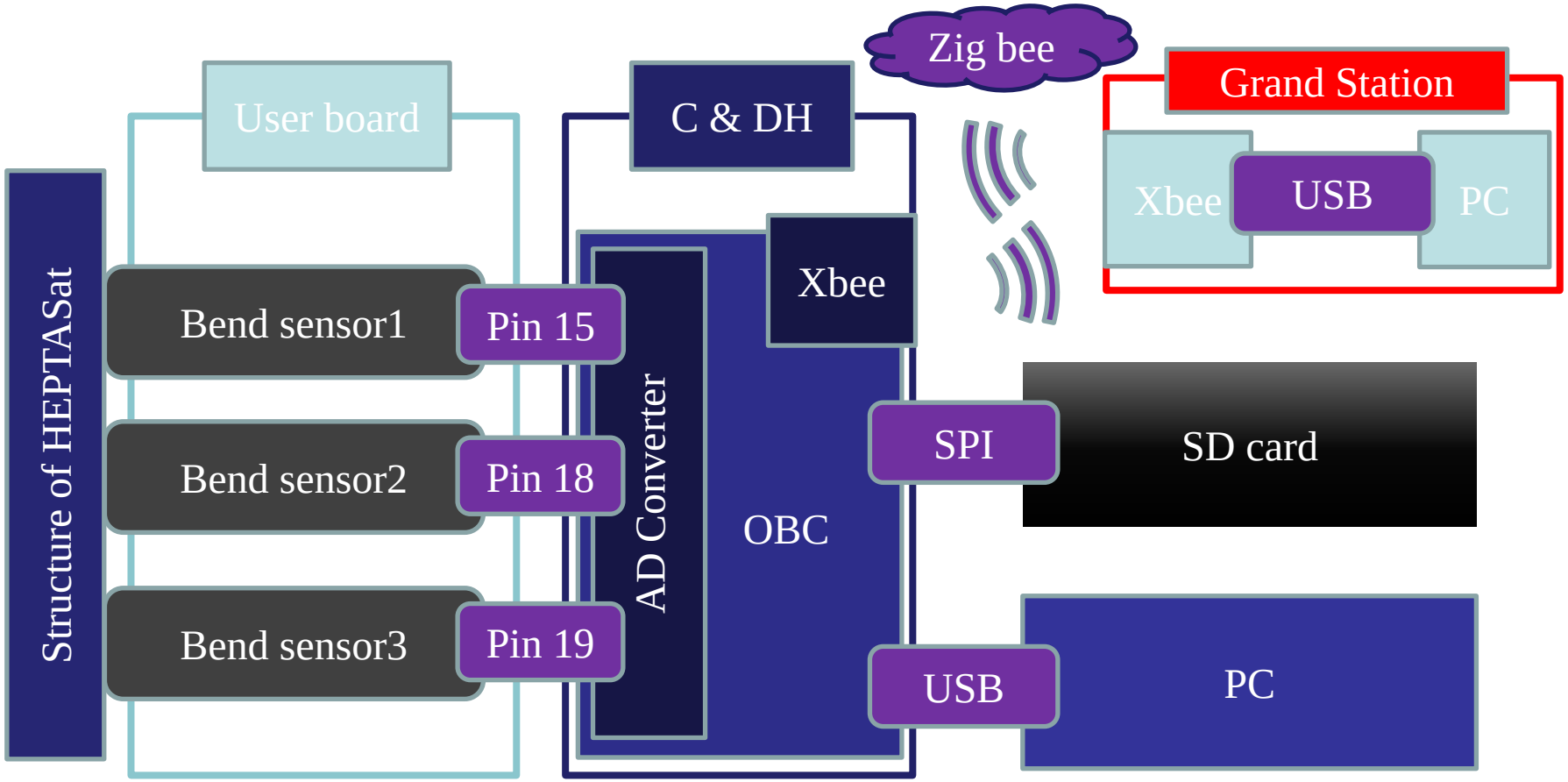
System Architecture



Bus Subsystems

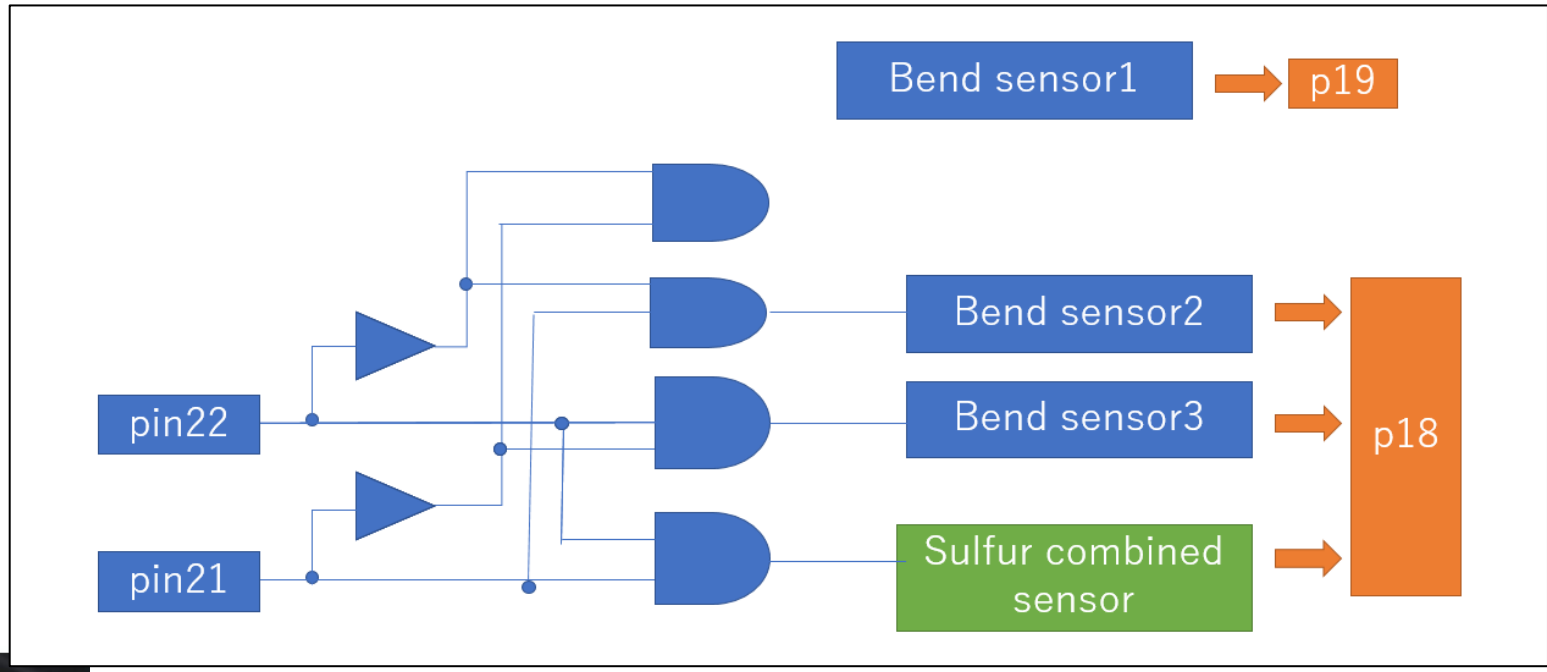


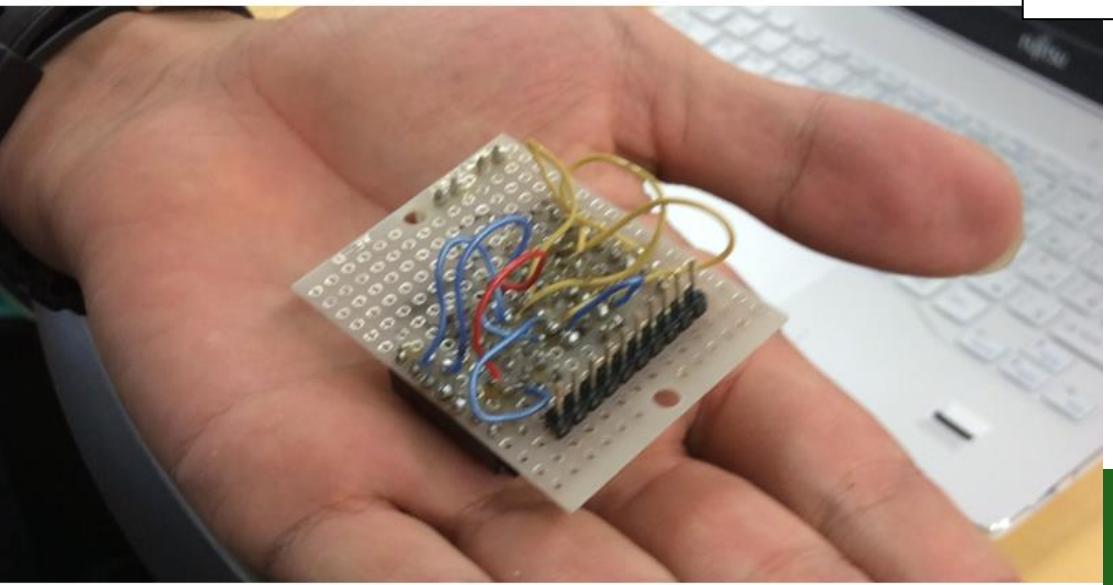
Payload Subsystem Architecture



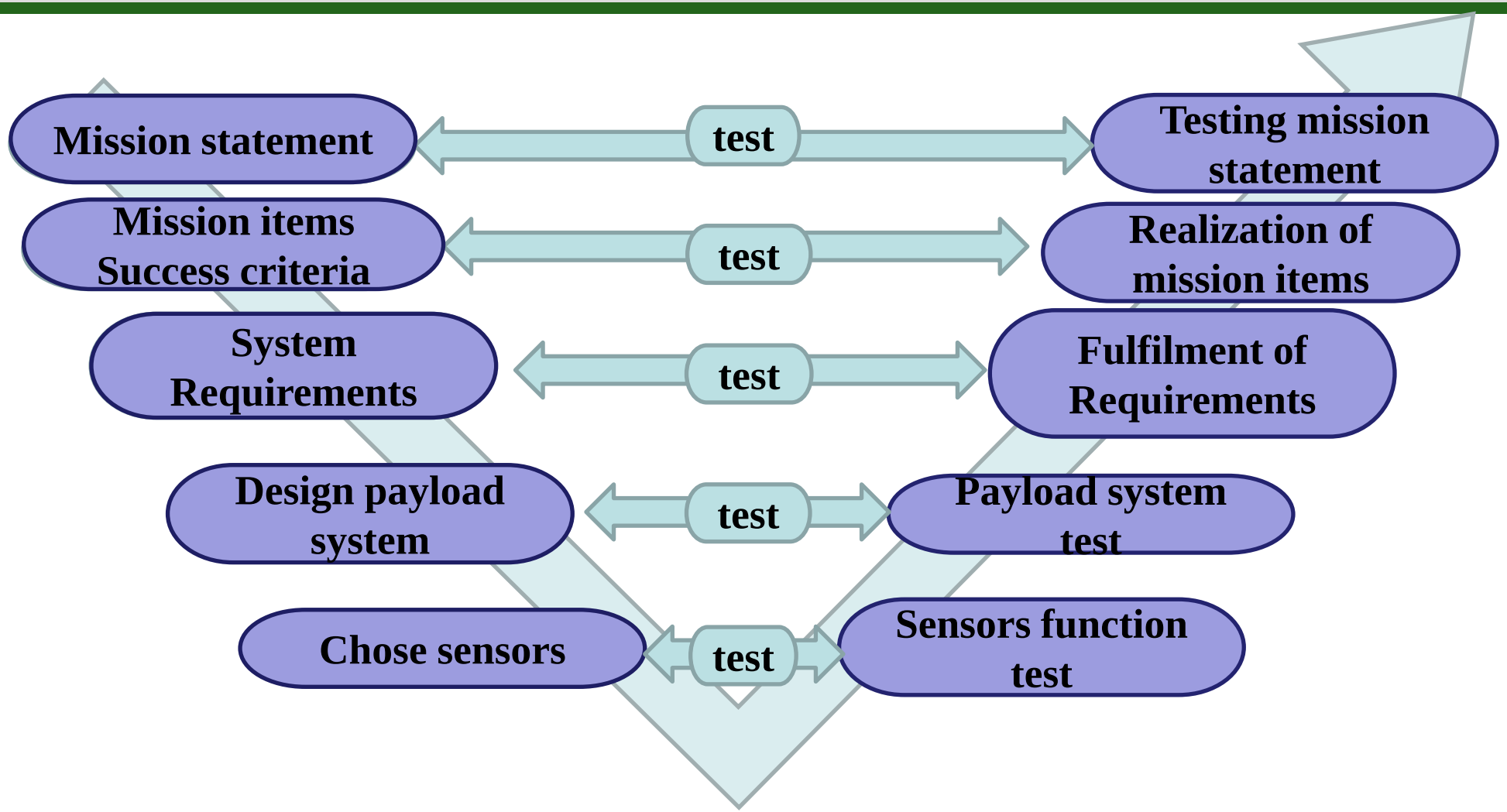
How about the additional boards?

- Our development was delayed.
- We found another analog pin of mbed.
- Sensitivity of sulfer sensor was not enough.



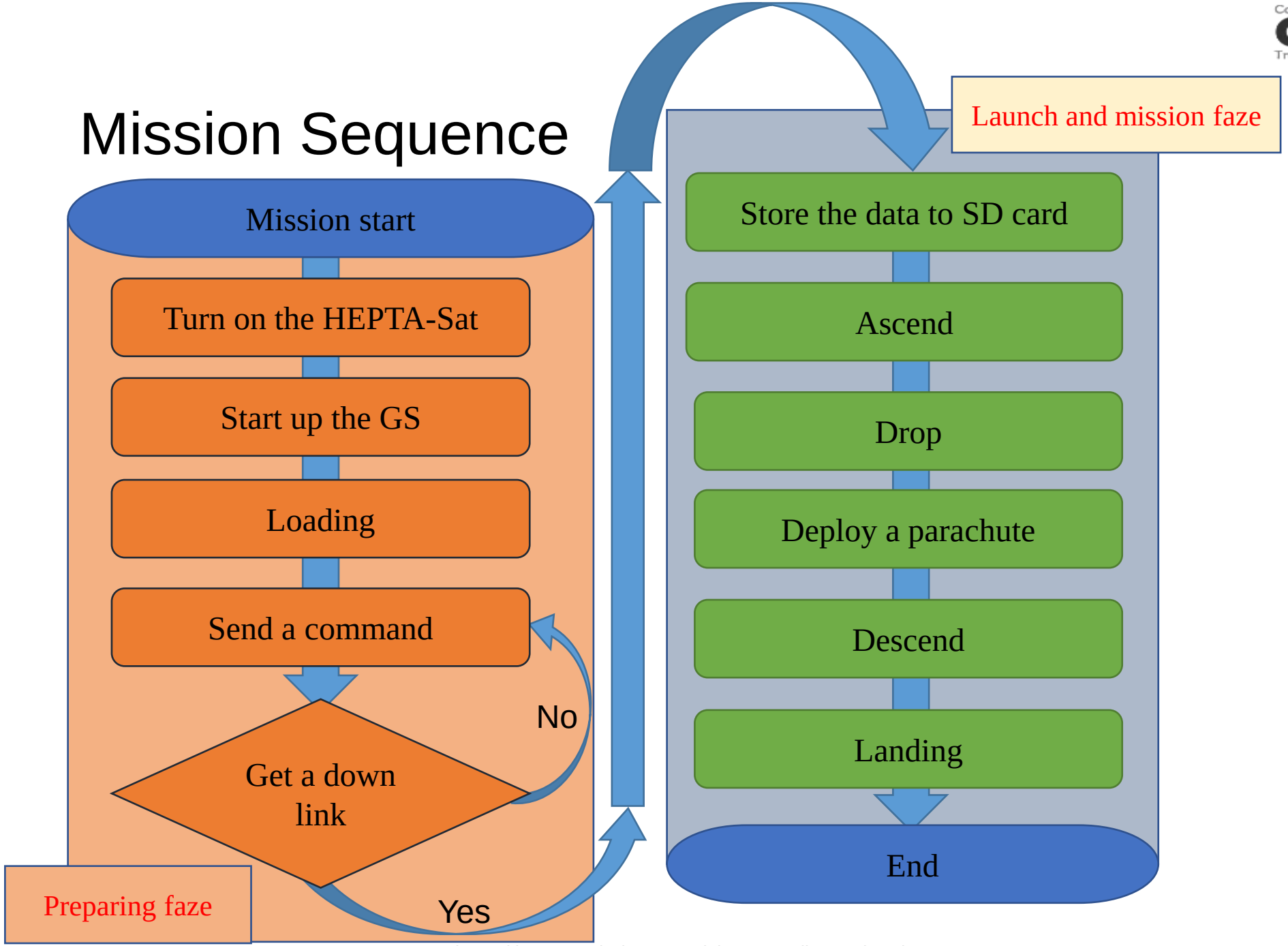


Validation and Verification Plan/Testing



V-Model of our HEPTA-Sat

Mission Sequence



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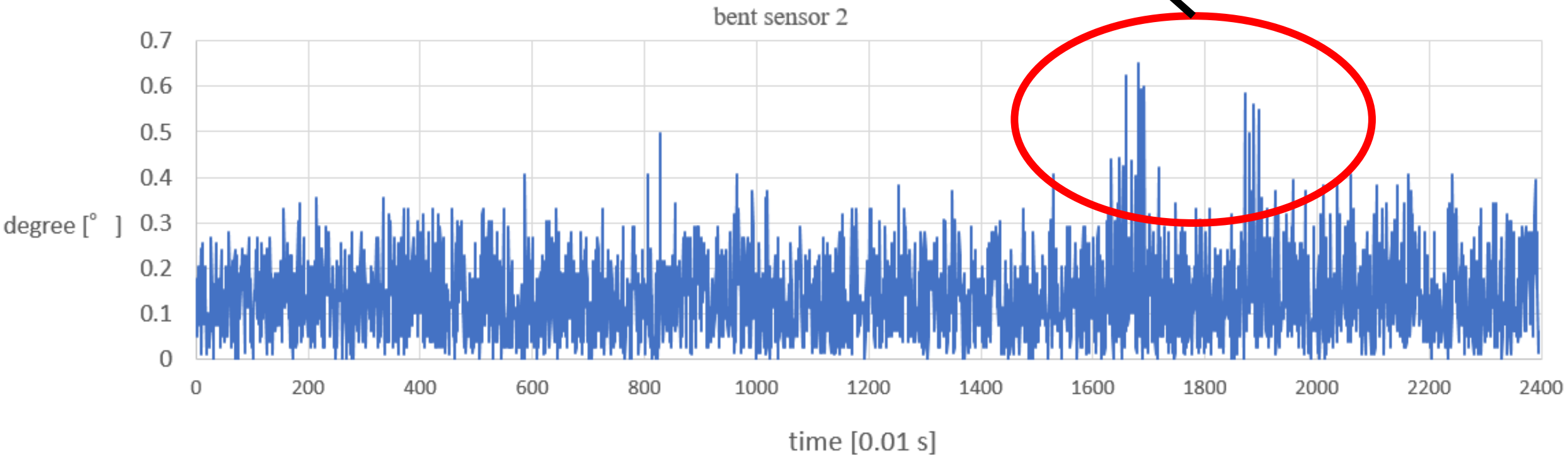
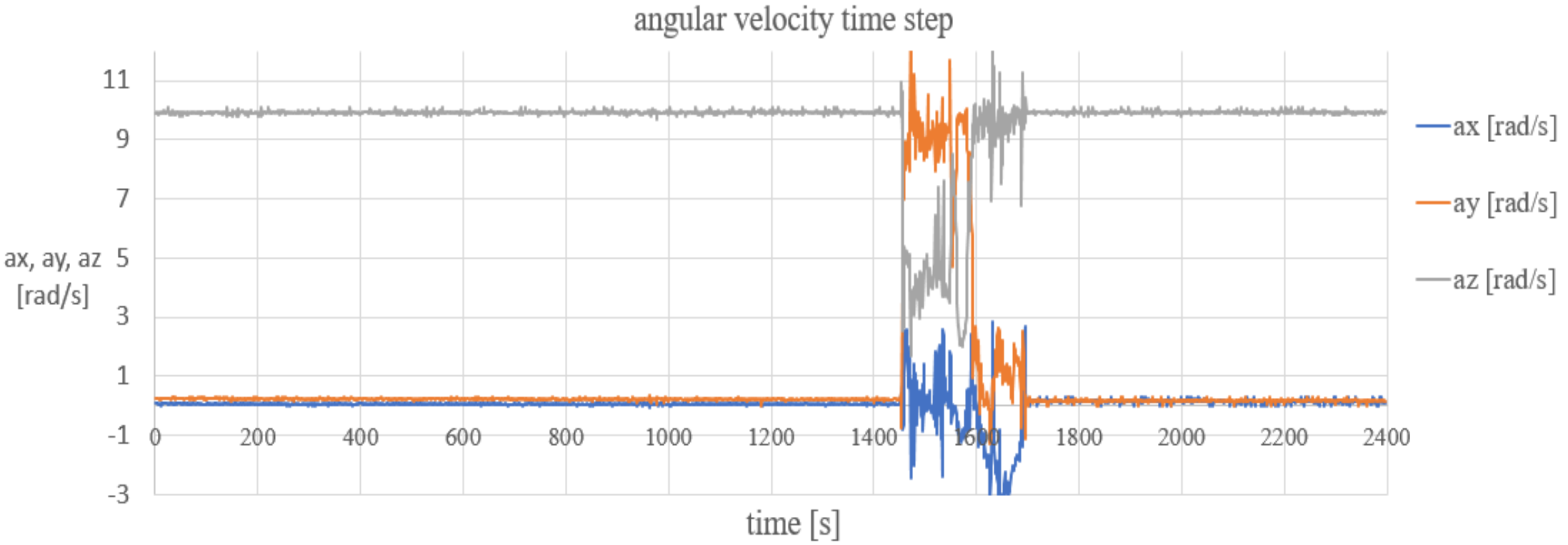
Flight Result: First Attempt

We succeed to get the one bent sensor data.

Peak of 0.5 ~0.6 degree



Flight Result: First Attempt



Flight Result: Second Attempt

We cannot get the data of bent sensor data.

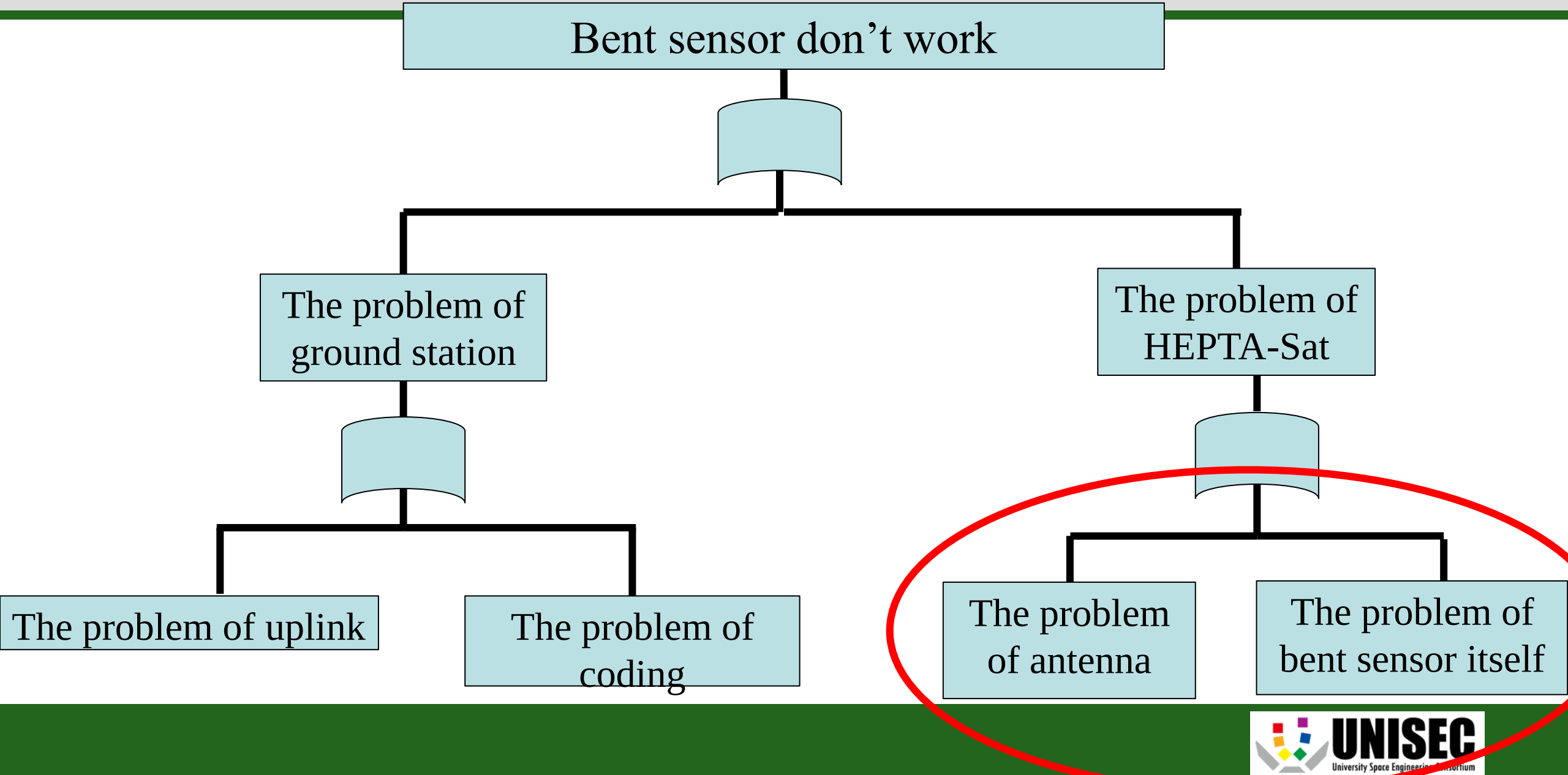
During the mission, we lost downlink through “teratarm” and the data stored in SD card is incorrect.

We have a communication trouble and bent sensor trouble.

Mission criteria

Parameter	Criteria	Mission result
Minimum success	(1) We get data from one bent sensor	OK
Full Success	(2) We get data from all bent sensor	Not ※ All bent sensor has not work.
Extra Success	(3) We finish the analysis of data of bent sensor	Partly ※

FTA (False Tree Analysis)



FTA (False Tree Analysis)

Problem of Bent sensor itself

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We conduct soldering to Bent sensor

↓

We use not dip type but flat type

↓

We are thinking use additional circuit

Problem of antenna

↓

We add bent sensor after drop test.

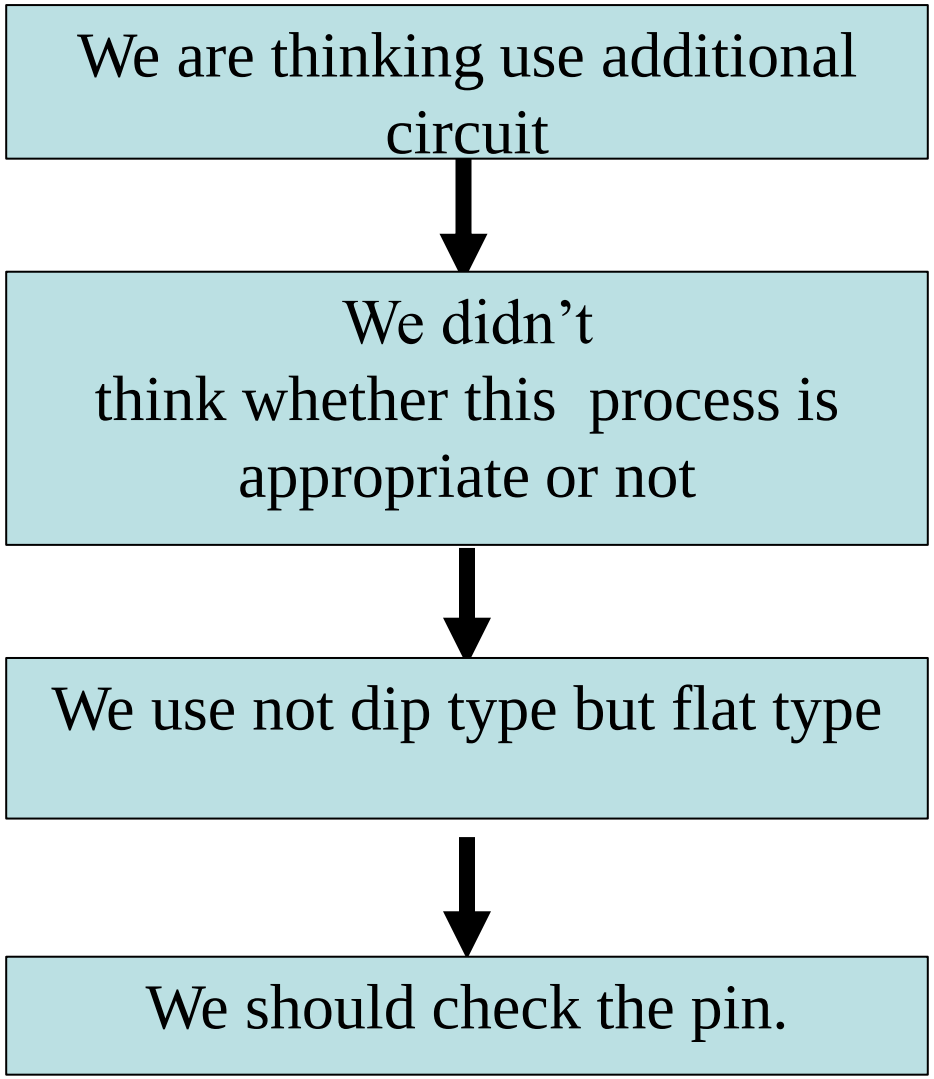
↓

We didn’t have a time to complete additional circuit

↓

We will use additional circuit because we want to use 4 pin

FTA (False Tree Analysis)



From point of view of system engineering,

- We should check the usage of bent sensor is appropriate or not.
- When we decide to make additional circuit, we should check this decision is suitable or not.

Conclusions

- Through our mission, we can get minimum success.
  However, only one bent sensor of result is difficult
  to calculate internal stress.

- We cannot reach the full success.
  There are two reasons.
  One is failure of antenna and other is failure of bent sensor itself.

Recommendation and Future Work (Mission)

- When our HEPTA-Sat drop directly to the ground 1st time, we assume HEPTA- Sat has damaged. That is why the bent sensor which has work 1st drop has not work 2nd drop.
  That is because we recommend you to catch the HEPTA-Sat as much as possible.

- As future work, we should analysis the degree data to force data in more detail.

Feedback and Recommendation (CLTP)

- Through this CLTP Program, TA of Nihon University help us many times kindly.

- If the drop test in gym has conducted one days late, our mission will be work more and more.

We thank you all CLTP TA and professor and participants!