

Powered Paraglider



Application

Academia

- Exploration
- Preservation
- Education tools

First Response

- Post-disaster analysis
- Communication
- Re-Construction

Defense

- Rapid Survey
- Supply Vessel
- Portability

Comparison of Platforms

Three Main Platforms

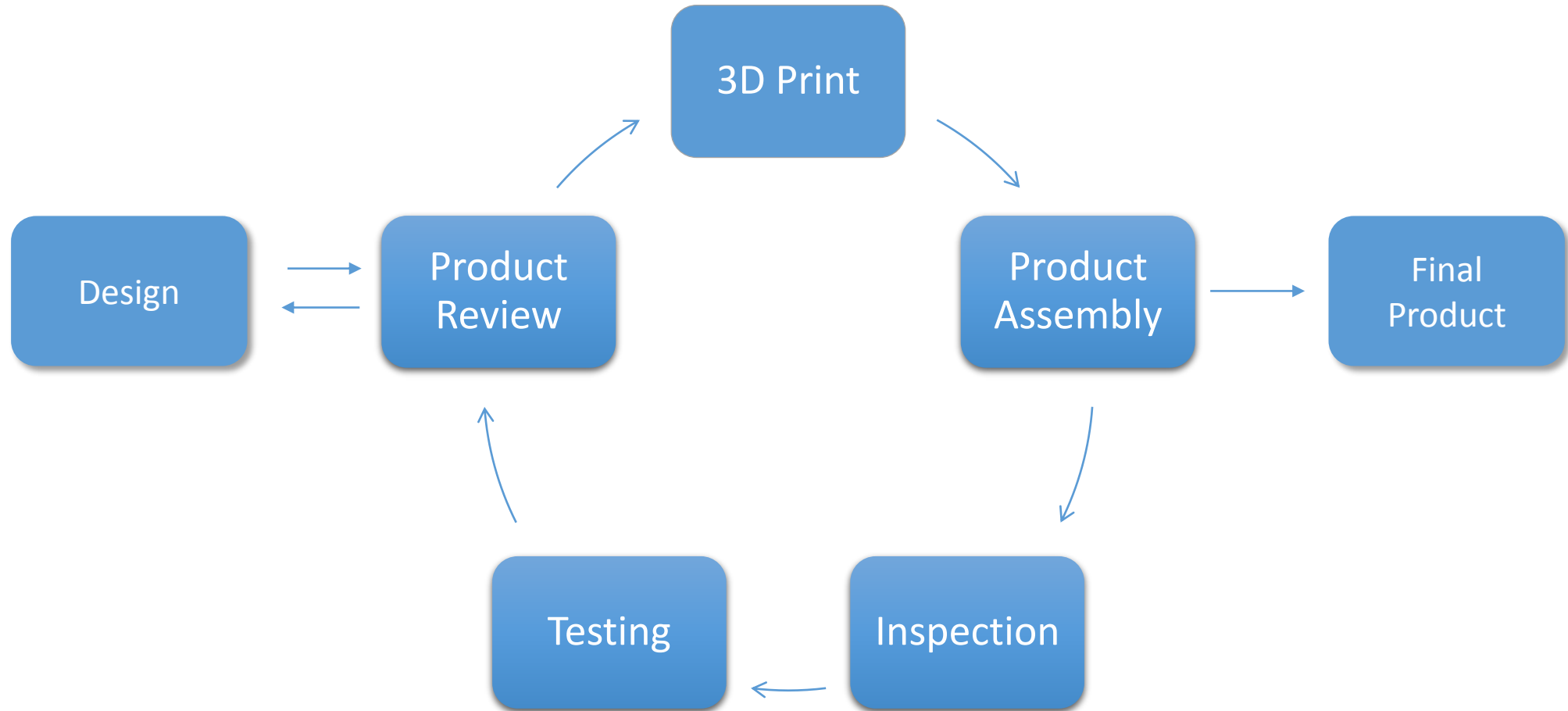
- Multi-Copters
- Fixed Wing Planes
- Foldable Wing Platforms

Platform	Payload (kg)	Flight Time (min)	Horizontal Airspeed (m/s)	Vertical Speed (m/s)	Max Wind Speed (m/s)	Take off space (m)
Multi-Rotor	1 - 2	< 30	5	3	12	5
Fixed Wing	<1	80	16	3	10	100
Paraglider	1 - 2	60-120	9	1	6	50

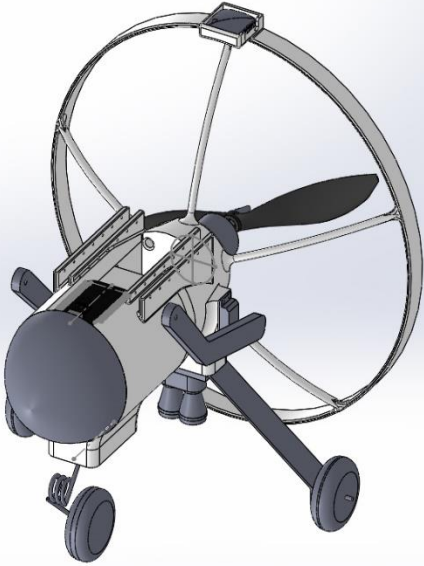
Long Endurance



Mechanical Design



Hardware Iteration

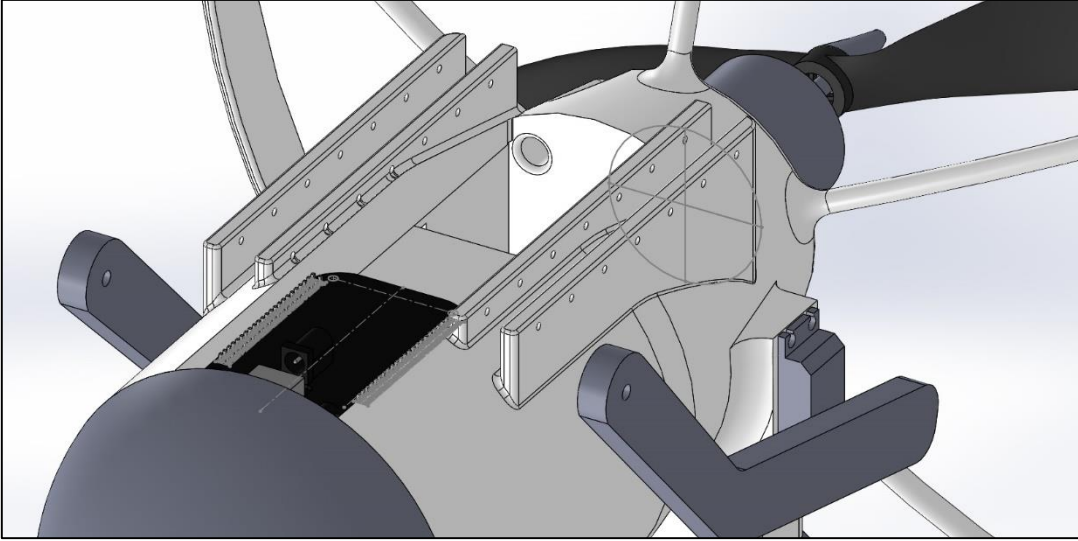


Paraglider 1.0

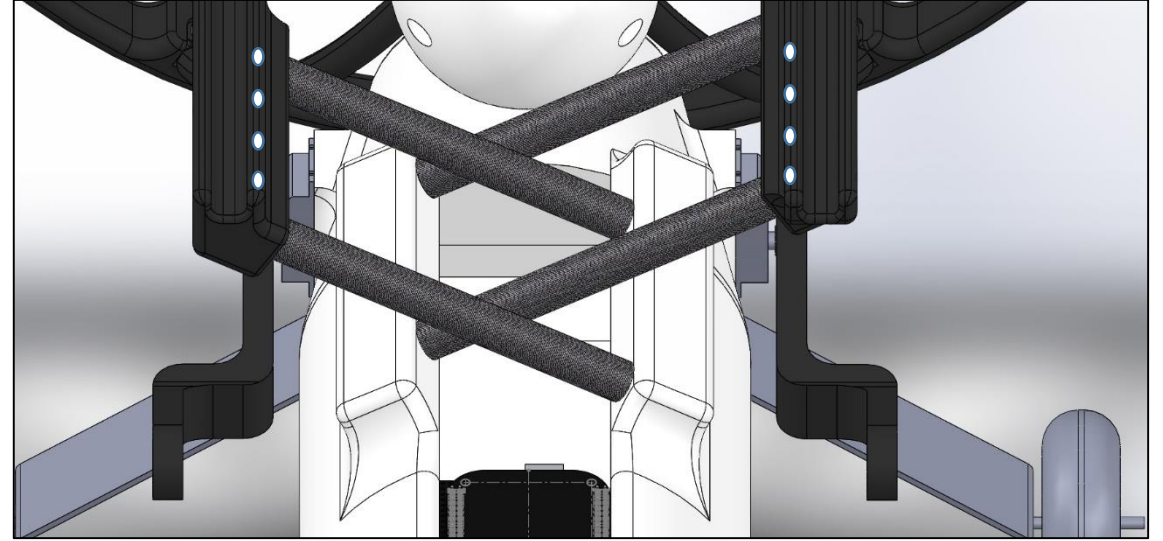


Paraglider 2.0

Hardware Iteration



Paraglider 1.0



Paraglider 2.0

Testing Site



Test Flight



Control Surface
Inspection



Wind Estimation

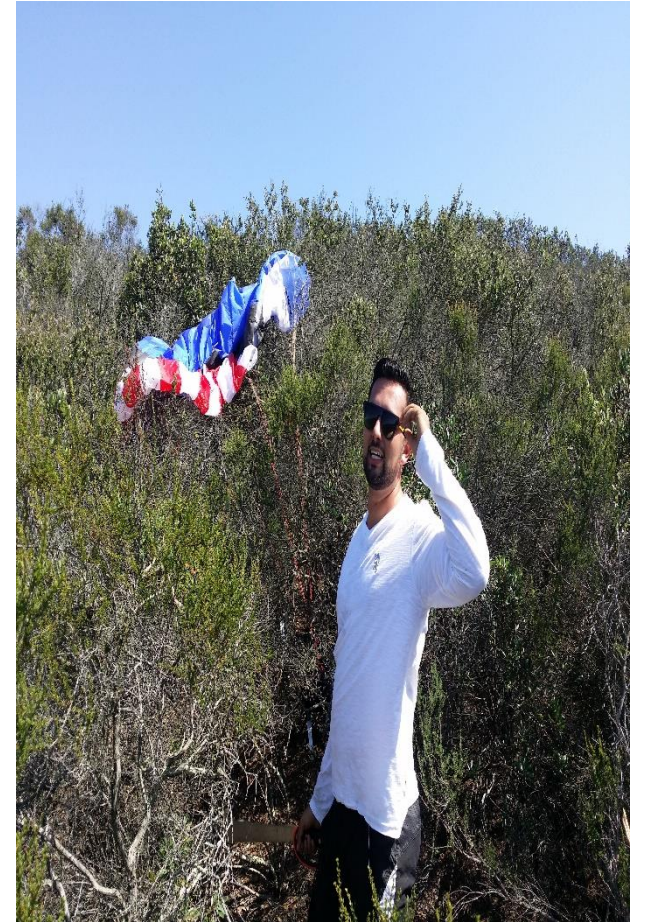
Test Flights



Take-off

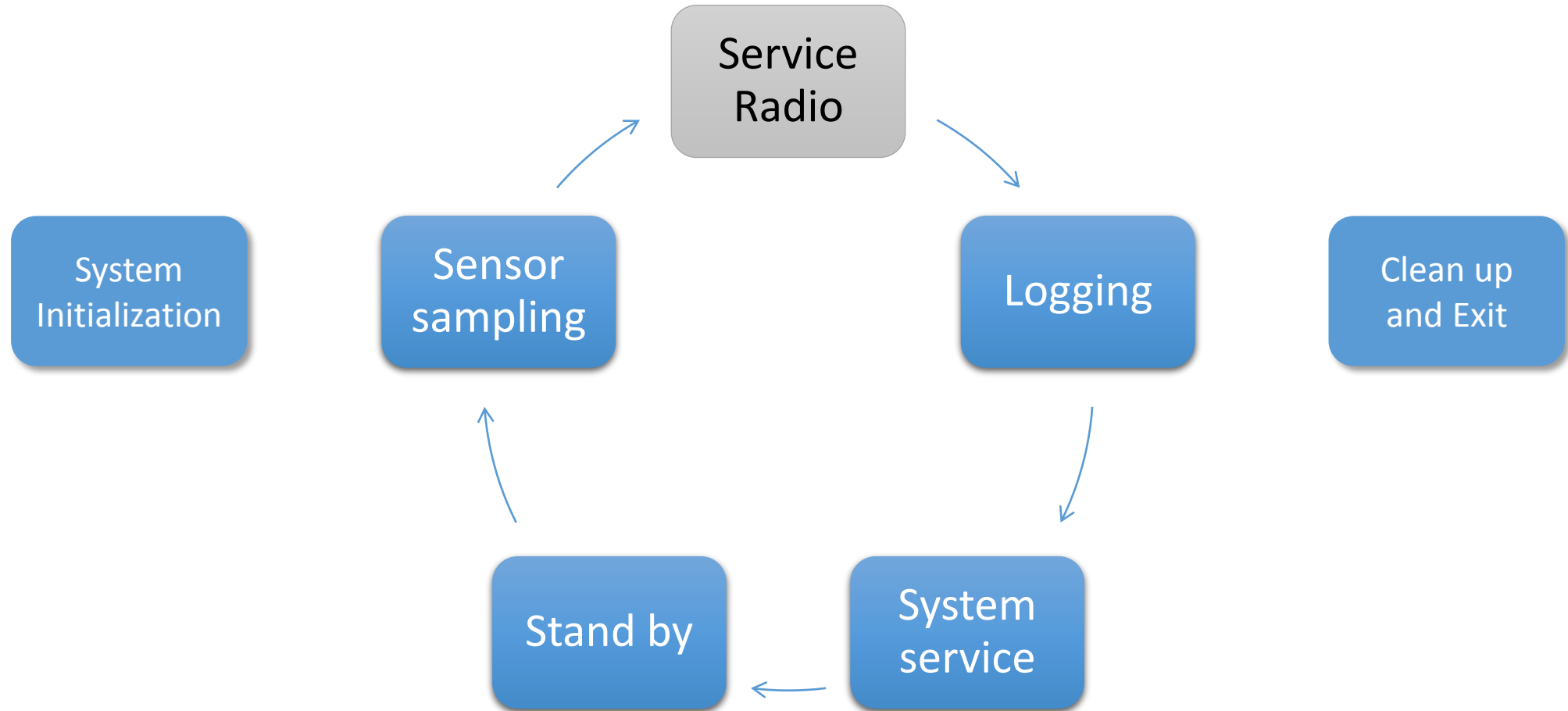


Flight



Landing

Embedded Software

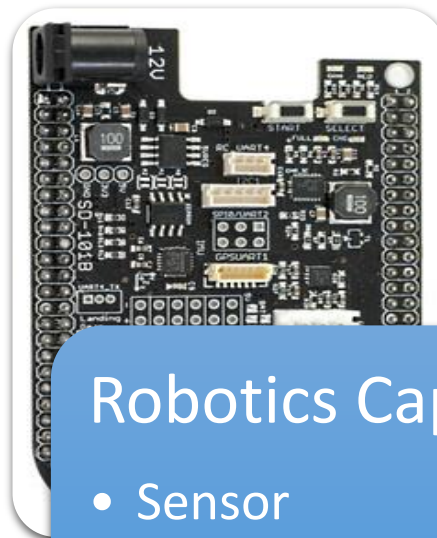


Hardware Platform



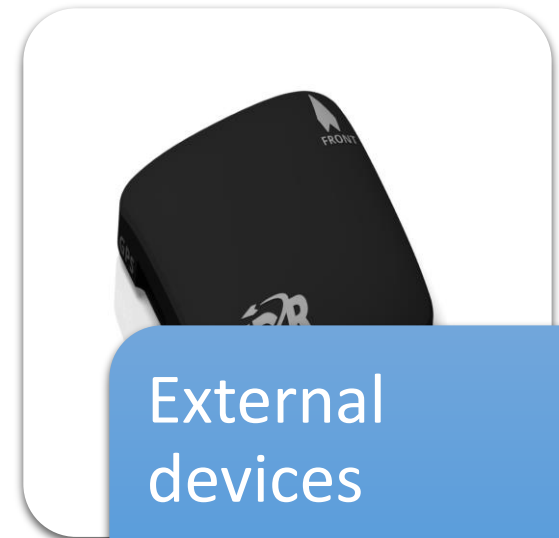
BeagleBone Black

- Strong processing power
- Linux Debian OS



Robotics Cape

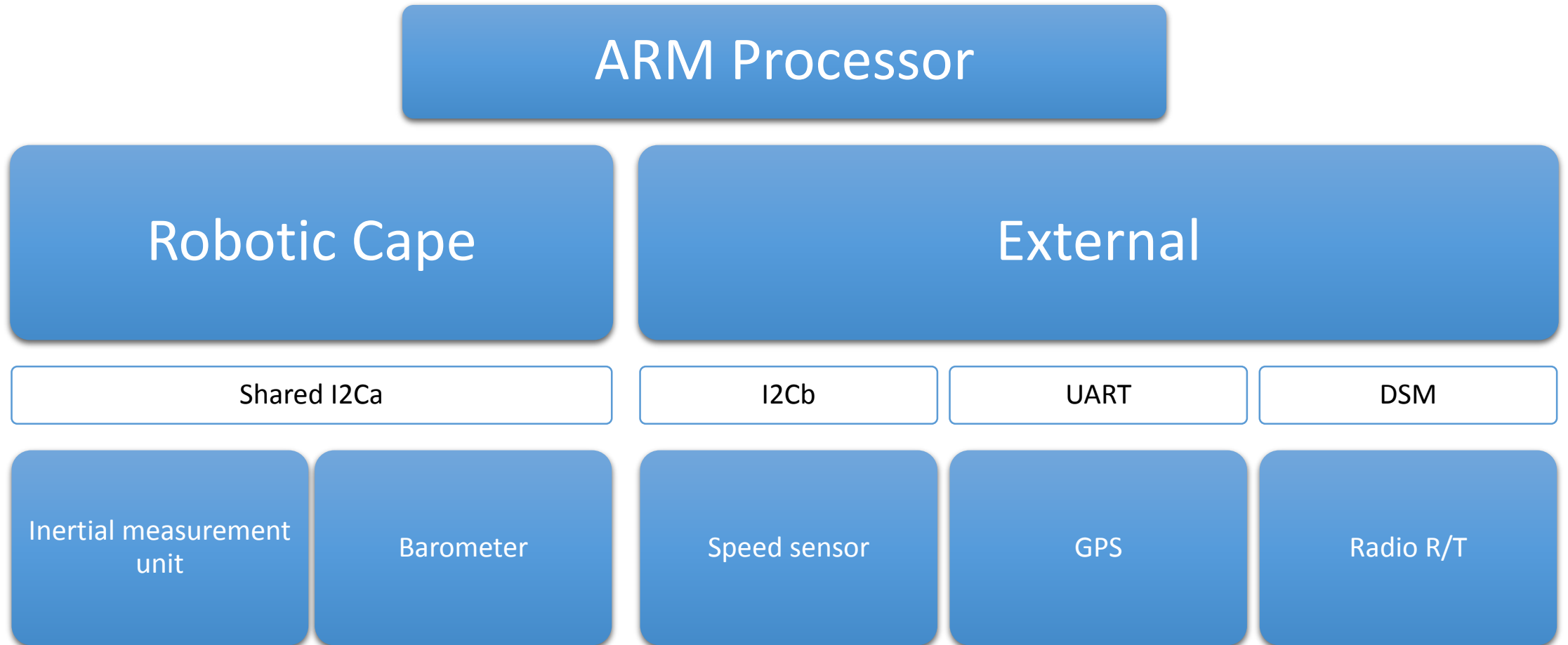
- Sensor integration
- Communication bus outlet pin head



External devices

- GPS
- ...

System Structure



Logging File

	A	B	C	D	E	F	G	H	I	J	K	L
1	time	roll	pitch	yaw	xa	ya	za	xg	yg	zg	temperat	pressure
2	4.27E+09	0.018568	0.327527	-0.08215	-574	-5538	14674	30	-89	23	29529	10176411
3	4.27E+09	0.01897	0.327502	-0.08229	-646	-6566	15660	26	-69	3	29532	10177691
4	4.27E+09	0.019163	0.327443	-0.08168	-168	-6168	15150	59	15	-117	29526	10177179
5	4.27E+09	0.019253	0.32706	-0.08119	292	-6138	15244	112	7	-97	29531	10176923
6	4.27E+09	0.019398	0.326585	-0.08201	-432	-5932	14946	131	-101	128	29530	10177179
7	4.27E+09	0.019572	0.326637	-0.08258	-464	-6404	15162	26	-61	91	29527	10176923
8	4.27E+09	0.019647	0.32661	-0.08226	-452	-6380	15246	55	11	-61	29526	10177179
9	4.27E+09	0.019647	0.325876	-0.08129	-190	-6132	15114	183	64	-173	29526	10177691
10	4.27E+09	0.019533	0.325123	-0.08034	176	-5636	14766	179	71	-165	29528	10177947
11	4.27E+09	0.019455	0.325267	-0.08031	-10	-6158	15152	-1	-5	-9	29528	10177179
12	4.27E+09	0.019504	0.325504	-0.08069	-530	-6200	15164	-1	-45	59	29528	10176923
13	4.27E+09	0.019526	0.325546	-0.08058	-98	-6024	15078	35	11	-21	29525	10177691
14	4.27E+09	0.019516	0.325559	-0.0806	-266	-5866	15148	34	-9	0	29528	10176923
15	4.27E+09	0.019579	0.325744	-0.08051	-366	-6182	15170	-5	-10	-21	29527	10177435
16	4.27E+09	0.019543	0.325926	-0.08019	-16	-6004	15104	7	27	-57	29532	10177691
17	4.27E+09	0.019514	0.326165	-0.08014	-154	-6050	15108	-9	-6	-13	29528	10177691
18	4.27E+09	0.019523	0.326481	-0.08034	-256	-6144	15136	-21	-22	31	29531	10176923
19	4.27E+09	0.019542	0.32677	-0.08044	-180	-6074	15146	-13	-14	15	29528	10177691
20	4.27E+09	0.01957	0.327064	-0.0806	-276	-6054	15124	-17	-22	23	29527	10177179

Next Steps

Software

- Receiver/Transmitter
- GPS
- Speed Sensor

Hardware

- Paraglider 3.0 (design)
- Servo arms
- Imaging payload integration

Control

- System Behavior
- Control Software