GNC Requirements & Interfaces

Requirements

1. The spacecraft's operational lifetime must be at least 3 years, and no more than 25 years.
2. The spacecraft shall estimate its angular velocity within ±0.3°/s of its true value.
3. The spacecraft shall reduce its angular velocity (“detumble”) to less than 3°/s in at most 48 hours.
4. Attitude controller shall meet stability criteria of 6 dB gain and 30° phase margin.
5. The spacecraft shall be able enter a "coarse" estimation mode with an attitude estimation error of less than ±5º.
6. The spacecraft shall be able to enter a "fine" estimation mode with an attitude estimation error of less than ±1º.
7. The spacecraft shall be able to measure the Earth's magnetic field to within xx Teslas.
8. The spacecraft shall be able to point itself within ±3° of the true sun vector.
9. The spacecraft shall determine its position with absolute position error < 1km.
10. The payload shall determine its position with absolute position error < 50km.
11. The GNC subsystem shall not exceed 200 g, as per the mass budget.
12. The spacecraft GNC subsystem shall have a peak power consumption below 1 Watt, as per the power budget.
13. The payload GNC subsystem shall have a peak power consumption below 1 Watt, as per the power budget.
14. The GNC subsystem shall be operable in Sun-synchronous orbit.

Interfaces

Mechanical	Avionics	Vision	Comms/Ops
System model parameters regarding inertia, actuators…	Power Limits on sensors and actuators	Vision → GNC: ECEF Landmark-to-pixel correspondences	Heartbeat GNC data: angular rate, GPS pos, Fault detection signals
Values regarding actuator and sensor placement	Memory limitations on control algorithms	GNC → Vision: estimates of attitude, angular rate, attitude covariance, angular rate covariance	sensor line-of-sight/ antenna pos (to not be blocked by antenna)
	Interfacing between flight computer and Payload board		data rate/power consumption as a function of attitude
	Software and hardware redundancies in case of failure		