CubeSat Configurator Report

Introduction

The following report was created using the CubeSat Configurator KBE Application developed by Gargi Sunil Pantoji and Nicolas Oidtmann for the Master Course *AE4204 Knowledge Based Engineering (2023/24 Q3)* at Delft University of Technology.

This report was generated on 17/06/2024 by USERNAME.

User Input

Mission Level Inputs:

Input Parameter	Value	Unit
Mission Lifetime	24	Months
Required Ground Sampling Distance	50	m
Number of Images per day	5	-
Orbit Type	SSO	-
Custom Inclination	N/A	degrees
Ground Station Selection	[58, 53, 49]	-
Required pointing accuracy	1	degrees

Ground Station Selection

Name	Lat	Lon	Company	Location	Elevation	Number
GS_58 (Delft)	51.9989	4.3735	TU Delft	Delft	90	58
GS_53 (Hawaii)	19.89	-155.7	Estrack	Hawaii	0	53
GS_49 (Kourou)	5.0	-52.0	Estrack	Kourou	0	49

CubeSat Design Weights

Input Parameter	Value	Unit
Mass Design Weight	0.4	-
Power Design Weight	0.3	-
Cost Design Weight	0.3	-

Instrument Specification

Input Parameter	Value	Unit
Minimum Operating Temperature	-10	°C
Maximum Operating Temperature	50	°C
Focal Length	40	mm
Sensor Pixel Size	7	µm
Average Power Consumption	1	W
Instrument Mass	500	g
Instrument Height	50	mm
Instrument Cost	10000	USD
Image Pixel Resolution	[1260, 1260]	-
Image Bit Depth	8	-

Application Output

Orbit Design

Output Parameter	Value	Unit
Altitude	285.71	km
Semi-Major Axis	6663851.29	m
Eccentricity	0	-
Inclination	92.73	degree
RAAN	0	degree
Argument of Periapsis	0	degree
True Anomaly	0	degree
Orbital Period	5413.759082132572	s
Average Eclipse Time per Orbit	1897.5	s
Average Eclipse Time per Day	30360.0	s
Average Communication Window per Orbit	103.125	s
Average Communication Window per Day	1650.0	s
Shortest Communication Window	60	s
Longest Communication Window	300	s
Number of Contacts per Day	7.0	-

Mass Budget

Subsystem	Mass (g)
Payload	500
ADCS	400
OBC	25

Structure	142.0
Thermal	0
Communication	190.0
Power	285.78458655154463
20 % System Margin	308.55691731030896
Total Mass	1851.3415038618534

Power Budget

Subsystem	Power (W)
Payload	1
ADCS (10% duty cycle)	0.14
OBC	0.1
Structure	N/A
Thermal (orbit average)	0.0
Communication (orbit average)	4.66
Power	N/A
20 % System Margin	1.1804652777777778
Average Power	7.082791666666666
Peak Power	8.59

Cost Budget

Subsystem	US Dollar
Payload	10000
ADCS	50000
OBC	6500
Structure	63000.0
Thermal	0
Communication	15000
Power	15178.690793956093
20 % System Margin	31935.738158791224
Total Cost	191614.42895274732

Component Selection

Communication Requirements

Parameter	Value	Unit
Required Downlink Data Rate	55.56288593967627	Kbits/s

Communication Selection

Company	Data_Rate	Power_DL	Power_Nom	Mass	Height	Cost	Min_Temp	Max_Temp	Score
Spacecom	2000.0	13	4.5	190.0	25	15000	-20	50	1.43

Onboard Computer Requirements

Parameter	Value	Unit
Required Onboard data storage	0.006034231026542887	Gbit

Onboard Computer Selection

Company	Storage	Power	Mass	Height	Cost	Min_Temp	Max_Temp	Score
Deep Thought	0.13	0.1	25	10	6500	-40	85	-0.93

ADCS Requirements

Parameter	Value	Unit
Required pointing accuracy	1	degree

ADCS Selection

Company	Pointing_Accuracy	Power	Mass	Height	Cost	Min_Temp	Max_Temp	Score
iADCS200	0.3	1.4	400	32	50000	-20	40	-0.26

Battery Requirements

Parameter	Value	Unit
Required battery capacity	3.291997245848518	Wh

Battery Selection

Company	Mass	Height	Cost	Min_Temp	Max_Temp	Capacity	Score
CrystalSpace P1U	130	12.0	7000	-40	85	14	-0.63

Solar Panel Requirements

Parameter	Value	Unit
Required solar panel power generation	10.904921058608124	W

Solar Panel Selection

Area	Cost	Mass
0.03188997945116735	8178.690793956093	155.78458655154463

Structure

Parameter	Value	Unit
Form Factor	1.5	-
Structure Mass	142.0	g
Structure Cost	63000.0	USD
Distance CoM to geometric center	0.54	mm

Thermal Requirements

Max Temperature	Min Temperature	Temperature Margin
50	-10	5

Thermal Coating Selection

Coating	Absorptivity	Emissivity	Hot Case	Cold Case	Hot Margin	Cold Margin

1/2 mil Aluminized Kapton	0.34	0.55	300.99	286.74	17.16	18.59

Thermal Heater Sizing

Heater Power	Cold Case with Heater	Cold Margin with Heaters
0	286.735896693118	18.585896693118002