



UNMANNED SOLAR POWERED AIRSHIP CONCEPT EVALUATION

Preliminary Design Report

<subsystem name>

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Acronyms

APR Array Power Regulator	LEO Low Earth Orbit
B2R Buck-Boost Regulator	LT Linear Technology
BCR Battery Charge Regulator	MDC Mode Detection Circuit
BDR Battery Discharge Regulator	MEA Main Error Amplifier
BJT Bipolar Junction Transistor	MPP Maximum Power Point
BoIBB Boost Interleaved By Buck	MPPT Maximum Power Point Tracking
BoSBB Boost Superimposed By Buck	MPPTU Maximum Power Point Tracking Unit
BuCBB Buck Cascaded By Boost	OpAmp Operational Amplifier
CCM Continuous Conduction Mode	PCB Printed Circuit Board
CM Current Mode	PCU Power Conditioning Unit
DCM Discontinuous Conduction Mode	PWM Pulse Width Modulated
DET Direct Energy Transfer	PFC Power Factor Corrector
ECSS European Cooperation for Space Standardization	PI Proportional-Integral
EMI Electromagnetic Interference	PV Photo Voltaic
EOL End Of Lifetime	RHPZ Right Half Plane Zero
EPS Electrical Power Subsystem	S3R Sequential Switch Shunt Regulator
ESA European Space Agency	SA Solar Array
ESR Equivalent Series Resistor	SEE Single Event Effect
GaAs Gallium Arsenide	SSA State Space Averaging
IC Integrated Circuit	TI Texas Instruments
IRF International Rectifiers	

List of Figures

1	Design diagrams	2
2	Software structure	2

List of Tables

1	Trade off analysis	2
2	Telemetry and telecommands	3
3	External interfaces	3

Contents

Acronyms	i
List of Figures	ii
List of Tables	iii
1 Introduction	1
2 Functional and Technical Requirements	1
2.1 Functional Requirements	1
2.2 Technical Requirements	1
2.3 Expected Performance	1
3 Preliminary Design	1
3.1 Preliminary Design Explanation	1
3.2 Software Structure	1
3.3 Trade-Off Analysis of Concepts	1
3.4 Argumentation for Chosen Concept(s)	2
3.5 Feasibility Study of Concept(s)	2
3.6 Telemetry and Telecommands	3
3.7 External Interfaces	3
4 Test and Verification of Design	3
4.1 Preliminary Verification of Design	3
4.2 Design Models and Verification Methods	3
5 Resources and Scheduling	4
5.1 Main Tasks	4
5.2 Parts List and Costs	4
5.3 Electronics Ground Support Equipment (EGSE)	4
5.4 Mechanical Ground Support Equipment (MGSE)	4
References	5
Appendices	5
A Some Appendix	5

1 Introduction

some text...

2 Functional and Technical Requirements

some text...

2.1 Functional Requirements

- A requirement
- Another requirement
- Etc...

2.2 Technical Requirements

- A requirement
- Another requirement
- Etc...

2.3 Expected Performance

- A performance
- Another performance
- Etc...

3 Preliminary Design

3.1 Preliminary Design Explanation

some text...

3.2 Software Structure

some text...

3.3 Trade-Off Analysis of Concepts

some text...

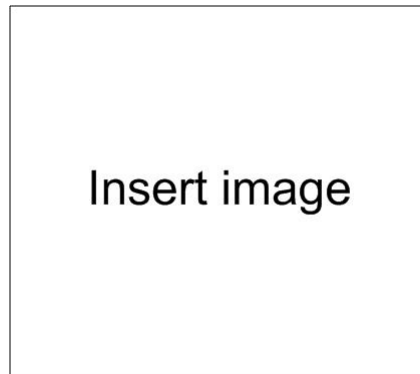


Figure 1 – *Design diagrams*



Figure 2 – *Software structure*

3.4 Argumentation for Chosen Concept(s)

some text...

3.5 Feasibility Study of Concept(s)

some text...

SA Regulator Concepts:	MPPT	Shunt-Regulator	Zener-diode Regulation	Etc...
Costs	Medium(some ICs required)	Medium(some ICs required)	Low(simple components)	...
Performance and efficiency	High(90 – 98%)	Medium(70 – 90%)	Low(50 – 70%)	...
Etc...

Table 1 – *Trade off analysis*

3.6 Telemetry and Telecommands

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Telemetry	Data rate/frequency	Data size
Battery voltage	Every 30 sec	1 byte
Solar array temperature	Every 30 sec	1 byte
Solar array voltage	Every 20 msec(MPP tracking)	2 bytes(MPP tracking)
Etc...
Telecommands	Parameters	Valid input range
set-output-voltage	< voltage > [1byte]	0; 255(= 7...9V)
Etc...

Table 2 – *Telemetry and telecommands*

3.7 External Interfaces

some text...

External interface	Implementation
Solar array mounting to rigid ballon structure	Screws and bolts
DC-DC regulators	Mounted on PCB which sists in system housing
Voltage/current sensor telemetry	Analog signals to Microcontroller
Etc...	...

Table 3 – *External interfaces*

4 Test and Verification of Design

4.1 Preliminary Verification of Design

some text...

4.2 Design Models and Verification Methods

some text...

5 Resources and Scheduling

5.1 Main Tasks

some text...

5.2 Parts List and Costs

some text...

5.3 Electronics Ground Support Equipment (EGSE)

some text...

5.4 Mechanical Ground Support Equipment (MGSE)

some text...

Appendices

A Some Appendix

some text...