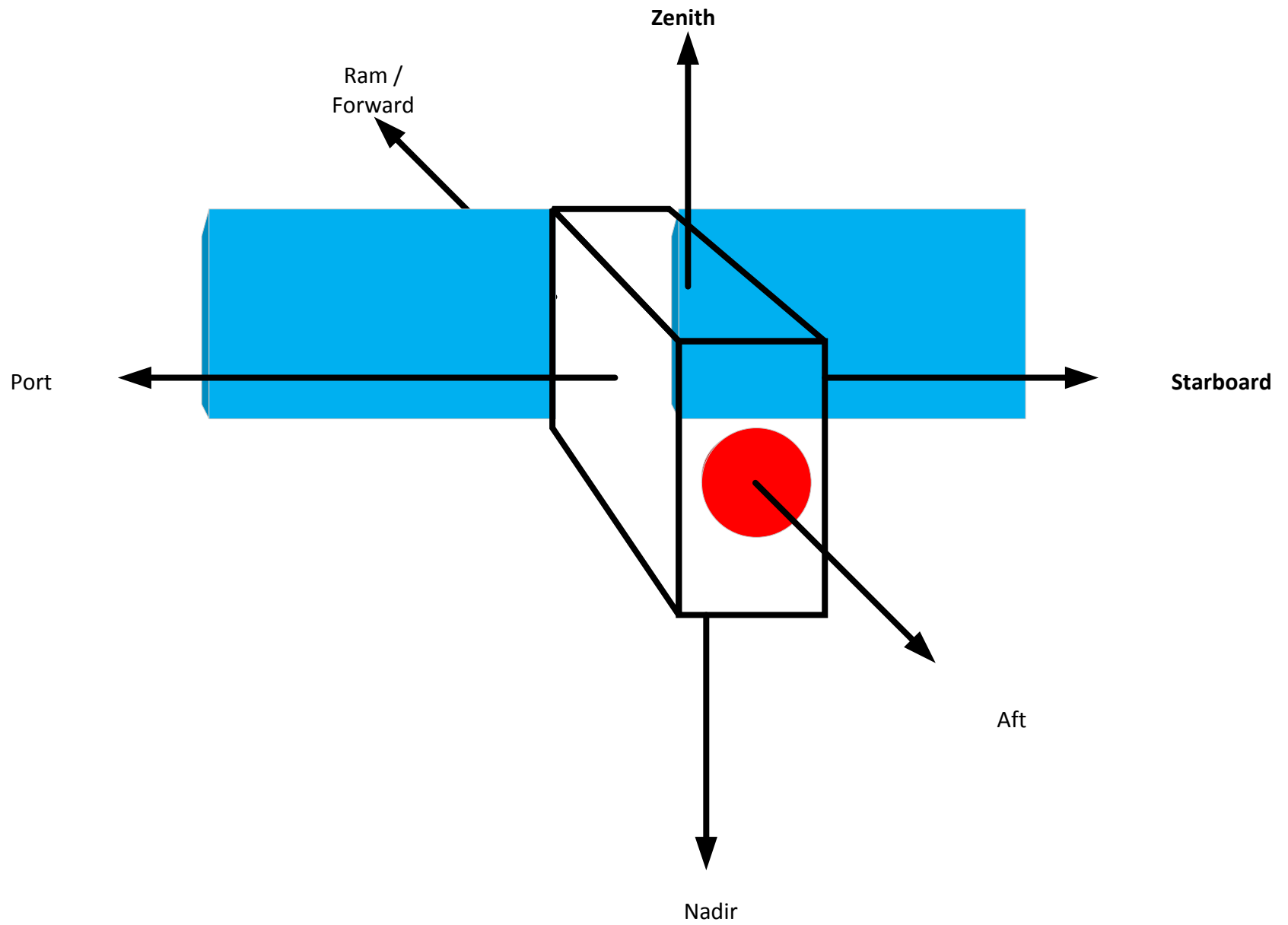
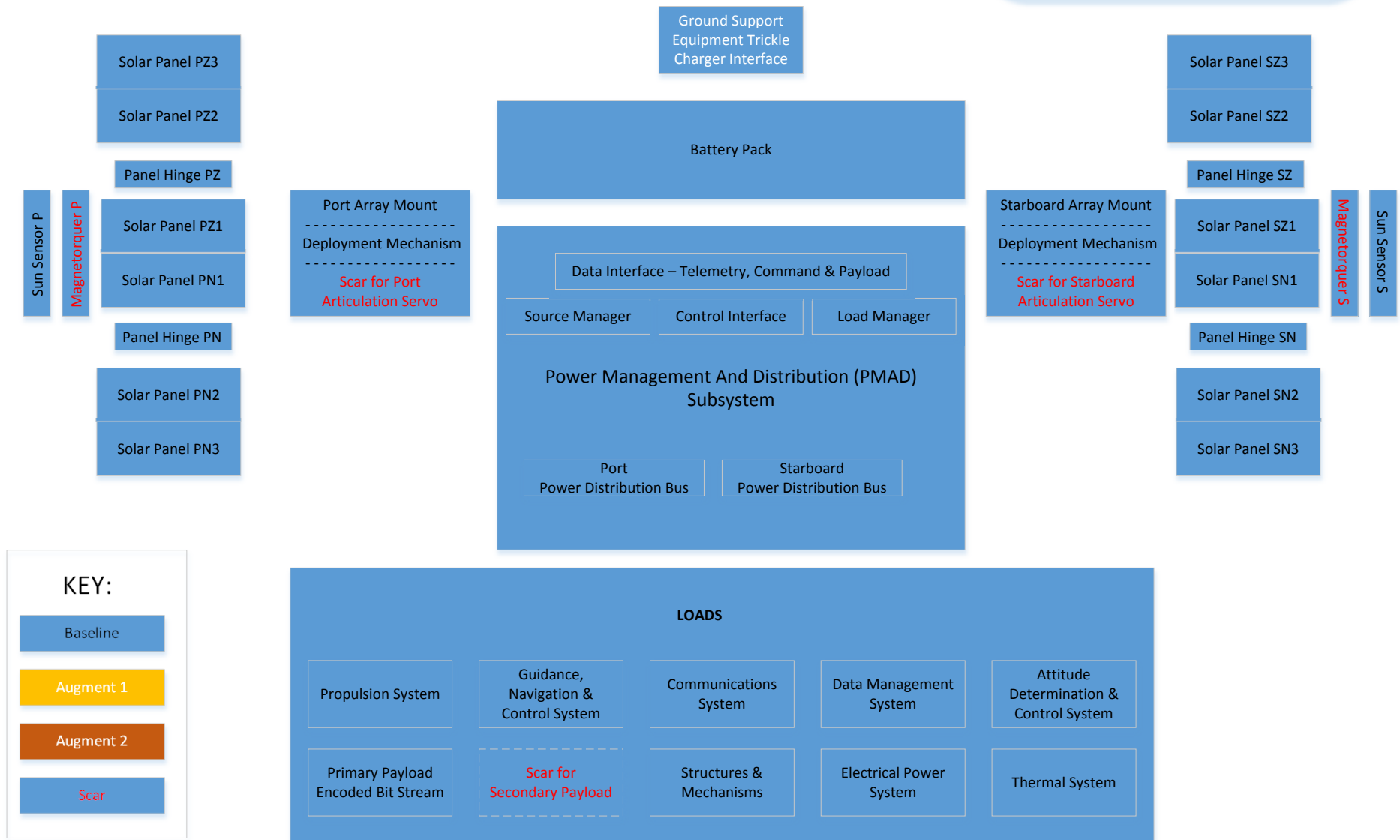


Alpha CubeSat Coordinate System

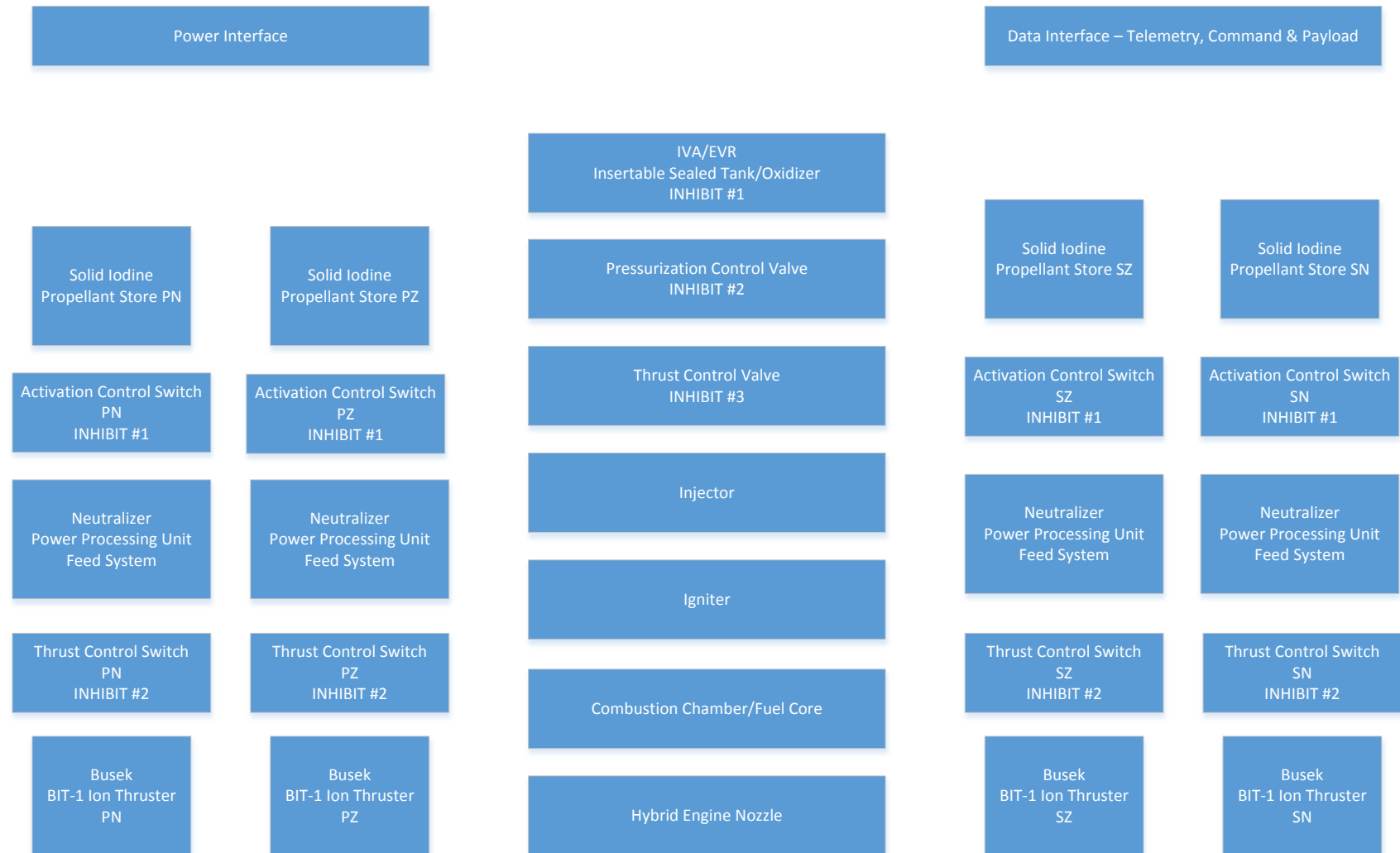


Alpha CubeSat Electrical Power System

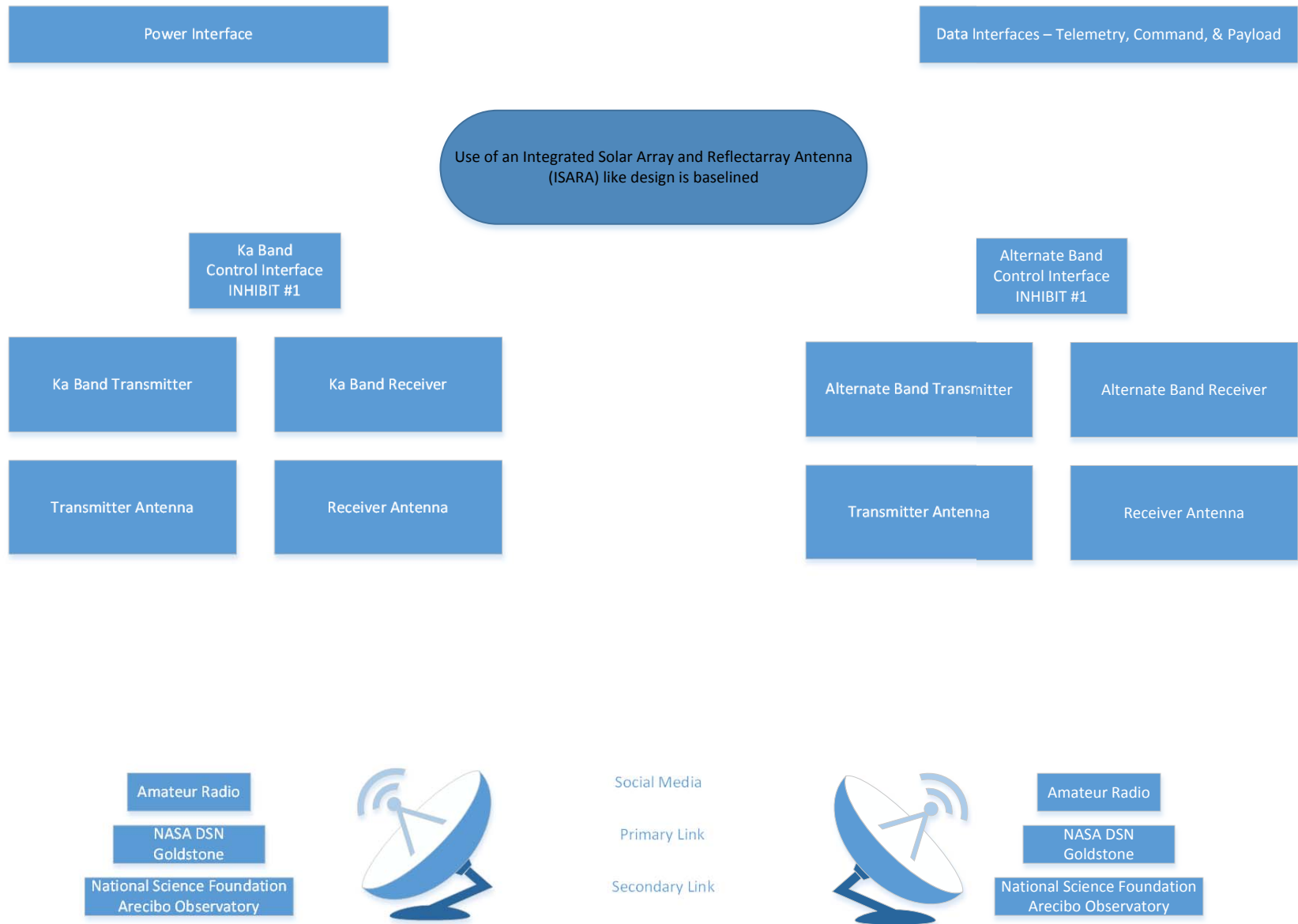
Use of an Integrated Solar Array and Reflectarray Antenna (ISARA) like design is baselined



Alpha CubeSat Propulsion System



Alpha CubeSat Communications System



Alpha CubeSat Guidance, Navigation, & Control System

Power Interface

Data Interfaces – Telemetry, Command, & Payload

Scar for Cold Gas
Subsystem

Sun Sensors

Star Tracker

GPS Receiver

KEY:

Baseline

Augment 1

Augment 2

Scar

Alpha CubeSat Data Management System

Power Interface

Data Interfaces – Telemetry, Command, & Payload

Central Processing
Unit

Main Memory

Radiation Shielded
USB Boot Key

On-Chip Video

On Board Computer System

On-Chip Wifi

On-Chip GPS

On-Chip Bluetooth

Primary Payload
Encoded Bit Stream

Near Real Time State Model Generator
(Software System)

KEY:

Baseline

Augment 1

Augment 2

Scar

Alpha CubeSat Attitude Determination & Control System

Power Interface

Data Interfaces – Telemetry, Command, & Payload

MTM
???

MTQ
Magnetorquers

Gyroscope

Sun Sensors

Reaction Wheels

KEY:

Baseline

Augment 1

Augment 2

Scar

Alpha CubeSat Primary Payload Encoded Bit Stream

Power Interface

Data Interfaces – Telemetry, Command, & Payload

Encoded Bit Stream
Generator

KEY:

Baseline

Augment 1

Augment 2

Scar

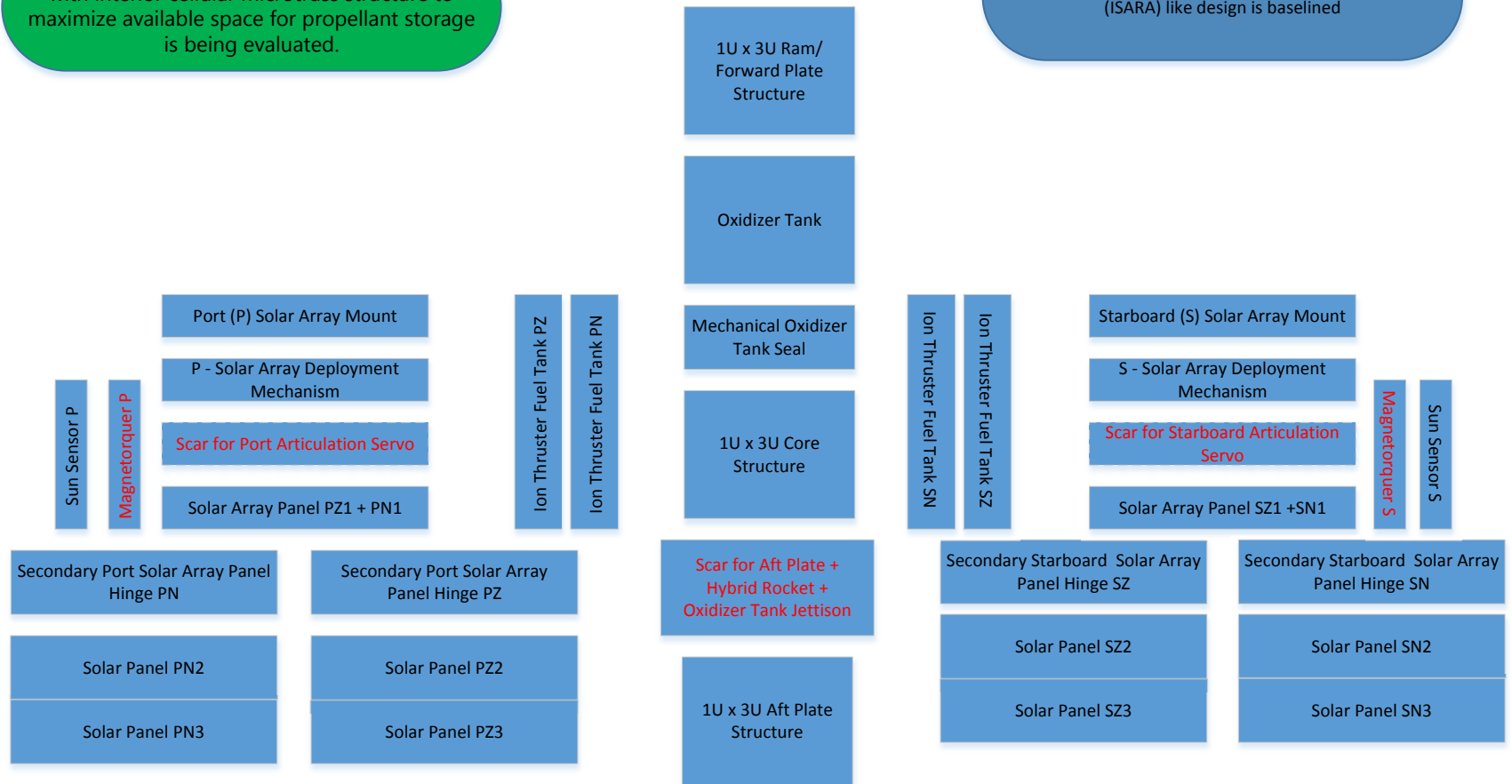
Alpha CubeSat Structures & Mechanisms

Power Interface

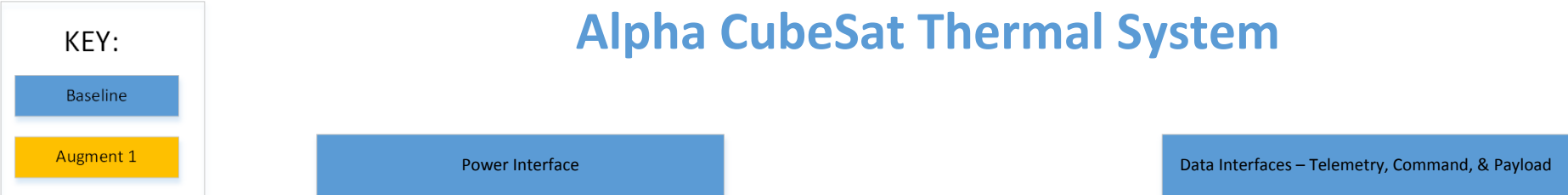
Data Interfaces – Telemetry, Command, & Payload

Use of 3D printed aluminum or titanium tanks with interior cellular microtruss structure to maximize available space for propellant storage is being evaluated.

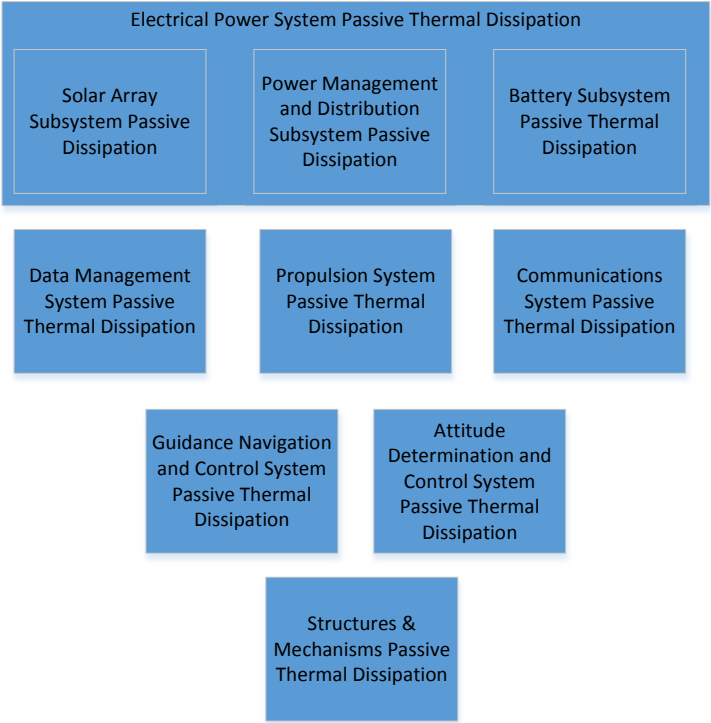
Use of an Integrated Solar Array and Reflectarray Antenna (ISARA) like design is baselined



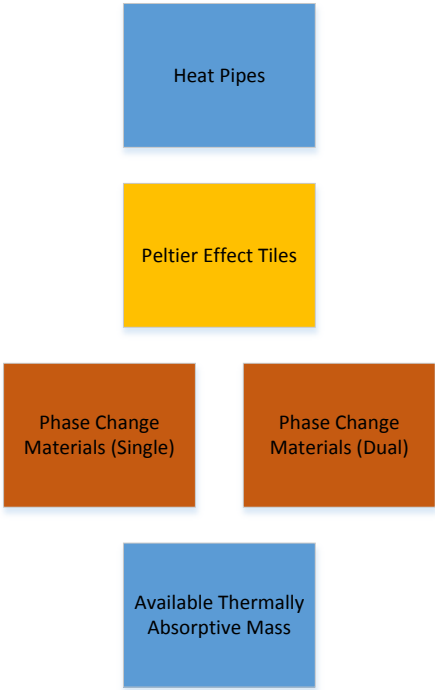
Alpha CubeSat Thermal System



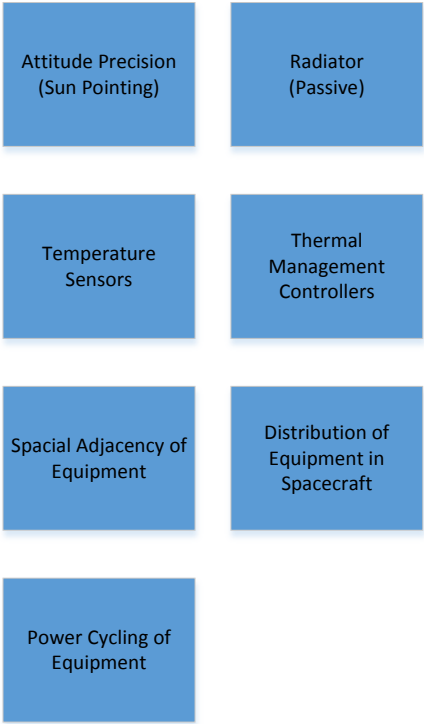
Heat Loads to Dissipate



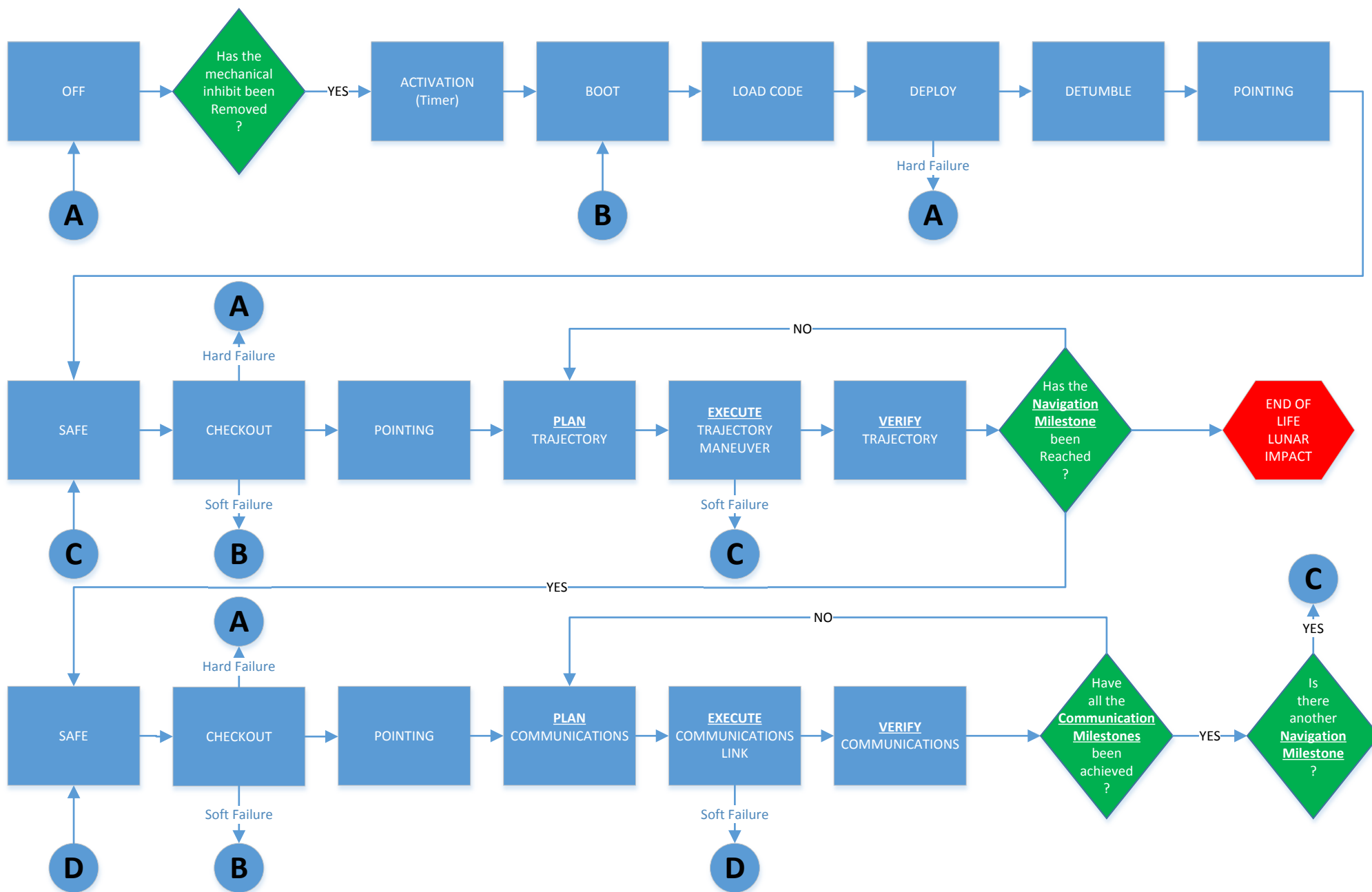
Tools to Move Heat



Tools for Mitigating and/or Rejecting Heat



Alpha CubeSat Mode / State Transitions



Alpha CubeSat Mode / State Transitions

FROM	TO	OFF	ACTIVATION	BOOT	LOAD CODE	DEPLOY	DETUMBLE	POINTING	SAFE	CHECKOUT	PLAN TRAJECTORY	EXECUTE TRAJECTORY MANEUVER	VERIFY TRAJECTORY	PLAN COMMUNICATIONS	EXECUTE COMMUNICATIONS LINK	VERIFY COMMUNICATIONS
OFF		-	Timer	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVATION		-	-	Scripted	-	-	-	-	-	-	-	-	-	-	-	-
BOOT	H-Reset	-	-	-	Scripted	-	-	-	-	-	-	-	-	-	-	-
LOAD CODE	-	-	-	-	-	Scripted	-	-	-	-	-	-	-	-	-	-
DEPLOY	H-Reset	-	-	-	-	-	Scripted	-	-	-	-	-	-	-	-	-
DETUMBLE	-	-	-	-	-	-	-	Scripted	-	-	-	-	-	-	-	-
POINTING	-	-	-	-	-	-	-	-	Scripted	-	Scripted	-	-	Scripted	-	-
SAFE	-	-	-	-	-	-	-	-	-	Scripted	-	-	-	-	-	-
CHECKOUT	H-Reset	-	-	S-Reset	-	-	-	Scripted	-	-	-	-	-	-	-	-
PLAN TRAJECTORY	-	-	-	-	-	-	-	-	-	-	-	Scripted	-	-	-	-
EXECUTE TRAJECTORY MANEUVER	-	-	-	-	-	-	-	-	Timer	-	-	-	Scripted	-	-	-
VERIFY TRAJECTORY	-	-	-	-	-	-	-	-	Scripted	-	Scripted	-	-	-	-	-
PLAN COMMUNICATIONS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Scripted	-
EXECUTE COMMUNICATIONS LINK	-	-	-	-	-	-	-	-	Timer	-	-	-	Scripted	-	-	-
VERIFY COMMUNICATIONS	-	-	-	-	-	-	-	-	Scripted	-	-	-	-	Scripted	-	-

H-Reset = Hard Reset turns the all systems off and restarts the activation timer (i.e., cold boots the spacecraft).

S-Reset = Soft Reset restarts all systems (i.e., warm boots the spacecraft).

Scripted = Command scripts are programmed sequences of commands which can be executed by scheduled time triggers and/or sensed event triggers.

Timer = Watch dog timer which forces a defined mode/state transition if an intended event does not occur within a specified timeframe.

Alpha Cubesat Systems on During Modes / States

	TO										
FROM		Electrical Power System (EPS)	Communications System (COMM)	Data Management System (DMS)	Structures & Mechanisms	Attitude Determination & Control System (ADCS)	Guidance, Navigation & Control System (GN&C)	Propulsion System	Thermal System	Primary Payload Encoded Bit Stream	Scar for Secondary Payload
OFF											
ACTIVATION		X									
BOOT		X	X	X							
LOAD CODE		X	X	X							
DEPLOY		X	X	X	X						
DETUMBLE		X	X	X		X					
POINTING		X	X	X		X	X				
SAFE		X	X	X							
CHECKOUT		X	X	X		X	X	X	X	X	
PLAN TRAJECTORY		X	X	X		X	X		X		
EXECUTE TRAJECTORY MANEUVER		X	X	X		X	X	X	X		
VERIFY TRAJECTORY		X	X	X		X	X		X		
PLAN COMMUNICATIONS		X	X	X		X	X		X	X	
EXECUTE COMMUNICATIONS LINK		X	X	X		X	X		X	X	
VERIFY COMMUNICATIONS		X	X	X		X	X		X	X	

Alpha CubeSat Systems

