

System \_\_\_\_\_  
 Subsystem \_\_\_\_\_  
 Component \_\_\_\_\_  
 Design Lead \_\_\_\_\_  
 Core Team Solar Sailors

**Potential  
 Failure Mode and Effects Analysis  
 (Design FMEA)**

Key Date 3/20/2021

FMEA Number \_\_\_\_\_  
 Prepared By Nickolas Borek  
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Component	Item / Function	Potential Failure Mode(s)	Potential Effect(s) of Failure	S e v	Potential Cause(s)/ Mechanism(s) of Failure	P r o b	Current Design Controls	D e t	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
												Actions Taken	New Sev	New Occ	New Det	New RPN
Case Top	Links the case cap, case bottom and cable clamp	Fracture	Loss of ability to keep water and dust out	3	Impact	6	NA	2	<b>36</b>	Preform impact test on the Case Top		Added fillets and design verified with Solidworks Sim	3	5	2	30
Case Top	Links the case cap, case bottom and cable clamp	Fracture	Loss of ability to keep water and dust out	3	solar corrosion (0-3) years	4	NA	7	<b>84</b>	Preform solar corrosion analysis on Case Top		Changed case material to PETG	2	3	5	30
Case Top	Links the case cap, case bottom and cable clamp	Fracture	Loss of ability to keep water and dust out	4	solar corrosion (4-10) years	7	NA	7	<b>196</b>	Preform solar corrosion analysis on Case Top		Changed case material to PETG	3	5	5	75
Case Top	Links the case cap, case bottom and cable clamp	Fracture	Loss of ability to keep water and dust out	3	Defect during 3D printing process	5	NA	7	<b>105</b>	Optimize printer g-code		3D print instructions added to the user manual	3	2	7	42
Case Top	Links the case cap, case bottom and cable clamp	Deformation	Inability to open case and loss of strength	4	High temperatures and exposure to chemicals	4	NA	3	<b>48</b>	Find a replacement material for PLA		Changed case material to PETG	4	2	3	24
Case Top	Links the case cap, case bottom and cable clamp	Sealant failure	Inability to keep water and dust out of the case	5	Improper case assembly	5	NA	5	<b>125</b>	Add detailed case assembly instructions to user manual		case assembly instructions added to the user manual	5	3	3	45
Sensor Cap	Holds the sensor, acrylic, and Teflon sheets	Fracture	Loss of ability to keep water and dust out	4	Impact	5	NA	4	<b>80</b>	Preform impact test on the Case Cap		verified design with Solidworks Simulations	4	3	4	48
Sensor Cap	Holds the sensor, acrylic, and Teflon sheets	Fracture	Loss of ability to keep water and dust out	3	solar corrosion (0-3) years	4	NA	7	<b>84</b>	Preform solar corrosion analysis on Case Cap		Changed case material to PETG	2	3	5	30
Sensor Cap	Holds the sensor, acrylic, and Teflon sheets	Fracture	Loss of ability to keep water and dust out	4	solar corrosion (4-10) years	7	NA	7	<b>196</b>	Preform solar corrosion analysis on Case Cap		Changed case material to PETG	3	5	5	75

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Sensor Cap	Holds the sensor, acrylic, and Teflon sheets	Fracture	Loss of ability to keep water and dust out	3	Defect during 3D printing process	5	NA	7	105	Optimize printer g-code		3D print instructions added to the user manual	3	2	7	42
Sensor Cap	Holds the sensor, acrylic, and Teflon sheets	Deformation	Inability to open case and loss of strength	4	High temperatures and exposure to chemicals	4	NA	3	48	Find a replacement material for PLA		Changed case material to PETG	4	2	3	24
Sensor Cap	Holds the sensor, acrylic, and Teflon sheets	Sealant failure	Inability to keep water and dust out of the case	5	Improper assembly	5	NA	5	125	Add detailed case assembly instructions to user manual		case assembly instructions added to the user manual	5	3	3	45
Case Bottom	Holds the PCB	Fracture	Loss of ability to keep water and dust out	3	Impact	6	NA	2	36	Preform impact test on the Case Bottom		Added fillets and design verified with Solidworks Sim	3	5	2	30
Case Bottom	Holds the PCB	Fracture	Loss of ability to keep water and dust out	3	solar corrosion (0-3) years	3	NA	7	63	Preform solar corrosion analysis on Case Bottom		Changed case material to PETG	2	2	5	20
Case Bottom	Holds the PCB	Fracture	Loss of ability to keep water and dust out	4	solar corrosion (4-10) years	5	NA	7	140	Preform solar corrosion analysis on Case Bottom		Changed case material to PETG	3	4	5	60
Case Bottom	Holds the PCB	Fracture	Loss of ability to keep water and dust out	3	Defect during 3D printing process	6	NA	7	126	Optimize printer g-code		3D print instructions added to the user manual	3	2	7	42
Case Bottom	Holds the PCB	Deformation	Inability to open case and loss of strength	4	High temperatures and exposure to chemicals	4	NA	3	48	Find a replacement material for PLA		Changed case material to PETG	4	2	3	24
Case Bottom	Holds the PCB	Sealant failure	Inability to keep water and dust out of the case	5	Improper case assembly	5	NA	5	125	Add detailed case assembly instructions to user manual		case assembly instructions added to the user manual	5	3	3	45
Cable Clamp	Locks the cable in place and limits cable pullout	Fracture	Loss of ability to keep water and dust out and	3	Impact	6	NA	2	36	Preform impact test on the Cable Clamp		Added fillets and design verified with Solidworks Sim	3	5	2	30

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												Actions Taken	New Sev	New Occ	New Det	New RPN
Cable Clamp	Locks the cable in place and limits cable pullout	Fracture	Loss of ability to keep water and dust out	3	solar corrosion (0-3) years	4	NA	7	84	Preform solar corrosion analysis on Cable Clamp		Changed case material to PETG	2	3	5	30
Cable Clamp	Locks the cable in place and limits cable pullout	Fracture	Loss of ability to keep water and dust out	4	solar corrosion (4-10) years	7	NA	7	196	Preform solar corrosion analysis on Cable Clamp		Changed case material to PETG	3	5	5	75
Cable Clamp	Locks the cable in place and limits cable pullout	Fracture	Loss of ability to keep water and dust out	3	Defect during 3D printing process	5	NA	7	105	Optimize printer g-code		3D print instructions added to the user manual	3	2	7	42
Cable Clamp	Locks the cable in place and limits cable pullout	Deformation	Inability to open case and loss of strength	4	High temperatures and exposure to chemicals	4	NA	3	48	Find a replacement material for PLA		Changed case material to PETG	4	2	3	24
Cable Clamp	Locks the cable in place and limits cable pullout	Sealant failure	Inability to keep water and dust out of the case	5	Improper case assembly	5	NA	5	125	Add detailed case assembly instructions to user manual		case assembly instructions added to the user manual	5	3	3	45