

Failure Modes & Effects Analysis

System Name: Precipitation Protector
 Major Function: Protect from Rainfall
 Prepared By: Precipitation Protection Team

FMEA Number: 1
 Page: 1
 Date: 4/23/02

Function or Requirement	Potential Failure Modes	Effect	Severity	Potential Causes of Failure	Occurance	Detection Method/ Design Controls	Detection	R P N	Actions Recommended to Reduce RPN	Responsibility and Target Completion Date
Protect user from precipitation	Tear in protective fabric	User gets wet; fabric flaps and contacts user	6	Foreign sharp object damages material	4	Fabric must have high toughness and must withstand 5 N/mm ² of pressure.	6	144	Use material at least as strong as current umbrellas.	
			6	Excessive tension on fabric when in use	2	Limit tension to 5 lb/f	3	36		
			6	Points of arms pierce fabric	2	Minimum radius for all edges of arms should be < 2 mm	2	24		
	Fabric separates from arm	User gets wet; fabric flaps and contacts user	6	Stitching breaks	4	Key life testing for operation (10hr*300day*8yr=24000 hours)	3	72		
			6	Excessive tension on fabric when in use	2	Limit tension to 5 lb/f	3	36		
			6	Sharp edge of arm wears through stitches	1	Minimum radius for all edges of arms should be < 2 mm	2	12		
	Arm of device breaks	User gets wet; fabric flaps and contacts user; arm swings and contacts user	7	User abuse during operation	5	Key life testing for opening and closing (8x*300day*8yr=19000 cycles)	5	175	Evaluate possibility of thicker arms, or high strength materials	

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			7	High winds	3	Must withstand steady 30 mph wind	6	126		
			7	Excessive stress when rotating arms	5	Key life testing for opening and closing, ensure sufficient clearance between arms and cap (19000 cycles)	4	140	Control clearance between cap and arms.	
	Chin strap breaks	User gets wet; device falls off head; device cannot be folded and stored	6	User pulls too hard when putting on	6	Key life testing, reinforce connection of straps (19000 cycles)	6	216	Ensure correct placement of velco attachment. Reinforce stitching.	
			6	High winds	3	Device must stay attached to user's head in steady 25 mph wind, 40 mph gust	6	108		
			6	Weak connection to device	3	Key life testing, reinforce connection of straps (19000 cycles)	4	72		
	Folding mechanism jams	User can't fold or unfold device	7	User improperly operates device	6	Clarify Instructions	4	168	Poke Yoke process for operation. Control clearance between cap and arms.	

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			7	Improper assembly of arm pivots and chassis	3	Revise assembly procedure	5	105		
			7	Tolerances of arm joints not correct	3	Re-tolerance arm joints	3	63		
	Insert falls out	Device falls apart	8	Press fit of insert fails	3	Re-tolerance insert-to-chassis joint	3	72		
								0		