CAPSTONE TEST SPECIFICATION



Device	Augmented Reality Headset															
Test date	TBD		Approvals for testing		VERSION											
Location	Concordia University		Approvate to testing		1.0											
Test LEAD		Program Manager			1.0											
	Faraz Yunus	Professor														
Test co-lead	Nicholas Cierson															
Test STAFF	TBD															
Observers																
						HAZARD and										
ENGINEER	ING VALIDATION TESTS					MISHAP										
						ANALYSIS								ļ.,		
						Hazard types (ref 2)										
	Name of analysis	Description of test Apply a steady force of 10N on the AR headset without the casing and observe if failure occurs. Apply a steady for of 250N with the casing and observe if	Expected	Observed	Date	Movement	stored energy	sharp edges	electricity	substance	radiation	physical agents	Description	Severity	Probability	Corrective or Contro
		headset without the casing and observe												i l		
VAL1	Steady Force Test	if failure occurs. Apply a steady for of 250N with the casing and observe if	No Failure Occurs				No	Yes	Yes	No	No	No	Danger of flying objects	Medium	Medium	
										<u> </u>	ļ			\vdash		
VAL2	Impact Test	largest unreinfoced area of the AR	No Failure Occurs				No	Yes	Yes	No.	No.	No.	Danger of flying objects	Modium	Medium	
VAL2	impact rest	headset at a height of 1m. (Exclude the screen and the heads un display)	NOT SINGLE OCCUPA							140	140	140		meanan	wediam	Proper protective es
VAL3	Drop Test	Drop the AR headset at 1m and observe	No Failure Occurs				No	Yes	Yes	No	No	No	Danger of flying objects	Medium	High	Proper protective er worn during tes extinguisher is n
		The AR headset will be run at its	Temperature is below						-	+	1				_	extinguisher is n
VAL4	Thermal Test	Drop a solid 500g steel ball at the largest unweinloced area of the AR headset at a height of 1m. (Exclude the screen and the heads up display) Drop the AR headset at 1m and observe whether device failure occurs. The AR headset will be run at its maximum capacity to observe its internal temperature and see if it is below the manufacturers rated temperature.	Temperature is below the maximum rated temperature and is comfortable to wear				No	No	Yes	No	No	No	Danger of overheating and causing a fire	Medium	Low	
*****	THE THE PERSON NAMED IN COLUMN TO SERVICE AND SERVICE	below the manufacturers rated	comfortable to wear					140				140	and causing a fire	mediani		
		Vibrate the AR headset in a vibration	No Hardware comes							-				\vdash	-	
VAL5	Vibration Test	machine and observe whether the harware comes loose	Loose				No	No	Yes	No	No	No	Danger of flying objects	Medium	Medium	
PREOPERA SAFETY	ATION CHECKS FOR VAL 1, VAL	2 and VAL 3														
200 211	Name of Task	Description	Checked	Initials	Date											
SFT1	Test Brief	Description Inform everyone of the test taking place (As per standard IEC60950) Ensure testers have reviewed standard														
SFT2	Test Procedure															
		Ensure all test personnel are wearing														
SFT3	Personal Protective Equipment	Ensure all test personnel are wearing the appropriate protective equipment (Safety Glasses) Ensure a barrier is placed to limit the		1	l											
SFT4	Projectile	Ensure a barrier is placed to limit the														
\$	Infostorem Fire	movement of projectiles	> <													
DEVICE INTEG																
DEV1	Structural	Ensure that the AR headset is free from structural damage Assembly is complete - no missing components.														
DEV2	Assembly - BOM	Assembly is complete - no missing components														
			_													
	Set1 1000 10															
\$	vibration			=												
> <	processiva															
5153	other	\sim	><	><	><											
INSPECTION					_											
INS1	Device Inspection	Engineer or Staff signature :			l											
PREOPER/	ATION CHECKS FOR VAL 4															
SAFETY	Name of Task	Description	Charled	teitiale	Posto											
SFT1	Test Brief	Inform everyone of the test taking place (As per standard IEC 60950) Ensure testers have reviewed the test														
SFT2	Test Procedure	Ensure testers have reviewed the test procedure														
\$	Fire	procedure														
	71130															
DEVICE INTEG	Structural	Ensure that the AR headset is free from	-													
		Ensure that the AR headset is free from structural diamage Assembly is complete - no missing components. Ensure that the AR headset is properly fastened to the windtunnel		1												
DEV2	Assembly - BOM	components.														
DEV3	Fasteners	Ensure that the AR headset is properly fastened to the windtunnel														
SYSTEM INTE	serry															
	Temperature	Ensure thermocouples are placed inside														
5Y52	Temperature Output Reader	of the AR headset Ensure that the temperature output		<u> </u>												
3132	Temperature Output Reader	reader is functioning properly	$\overline{}$	\sim												
% ~	vbraten shock															
~			=	$\geq \geq$	$\geq \geq$											
	procitive other	reader is functioning properly														
INSPECTION	Ultrainer Library Sportfull State															
INSPECTION INS1	processes other Device Inspection	Engineer or Staff signature :														
INS1	Device Inspection	Engineer or Staff signature :	Cherlant	nihiak	Date											
PREOPERA	Device Inspection	Engineer or Staff signature :	Checked	Initials	Date											
PREOPERA SAFETY	Device Inspection ATION CHECKS FOR VAL 5 Name of Task	Engineer or Staff signature : Description	Checked	initials	Date											
PREOPERA	Device Inspection	Engineer or Staff signature : Description Inform everyons of the test taking place	Checked	initials	Date											
PREOPERA SAFETY	Device Inspection ATION CHECKS FOR VAL 5 Name of Task	Engineer or Staff signature : Description Inform everyons of the test taking place	Checked	initials	Date											
PREOPERA SAFETY SFT1 SFT2	Davice Inspection ATION CHECKS FOR VAL 5 Name of Task Test Brief Personal protective equipment	Engineer or Staff signature : Description Inform everyons of the test taking place	Checked	intials	Date											
PREOPERA SAFETY SAFET2 SFT2	Davice Inspection ATION CHECKS FOR VAL 5 Name of Task Test Brief Personal protective equipment	Engineer or Staff signature : Description Inform everyons of the test taking place	Checked	initials	Curte											
PREOPER/ SAFETY SFT1 SFT2 DEVICE INTEG	Device Inspection ATION CHECKS FOR VAL S Name of Task Tost third Personal protective equipment	Engineer or Staff signature: Description Inform everyone of the text taking place Ensure all text personnel are wasning, the appropriate protective equipment (Saflert (Sisses)) Ensure that the AR headed is free from	Checked	Initials	Date											
PREOPERA SAFETY SFT1 SFT2 DEVICE INTEG	Device Inspection XTION CHECKS FOR VAL 5 Name of Task Test Brief Personal protective equipment Fige. Structural	Engineer or Staff signature: Description Inform everyone of the text taking place Ensure all text personnel are wasning, the appropriate protective equipment (Saflert (Sisses)) Ensure that the AR headed is free from	Checked	intials	Date											
PREOPER/ SAFETY SFT1 SFT2 DEVICE INTEG DEV1 DEV2	Divide Inspection INTION CHECKS FOR VAL 5 Name of Task Tost Brief Personal protective equipment Intion Assembly - BOM Assembly - BOM	Engineer or Staff signature: Description Inform everyone of the test taking place finace all test personnel are wasning the appropriate protective equipment (Sufley Gisses) Ensure that the AR headeds is free from structural damage Assembly is complete no missing	Checked	initials	Date											
PREOPER/ SAFETY SFT1 SFT2 DEVICE INTEG DEV1 DEV2	Device Inspection XTION CHECKS FOR VAL 5 Name of Task Test Brief Personal protective equipment Fige. Structural	Engineer or Staff signature: Description Inform everyone of the test taking place Essure all test personnel are wearing the appropriate predictive equipment Lating Staffactor Lating Staffactor Lating Staffactor Lating	Checked	restals.	Date											
PREOPER/ SAFETY SFT1 SFT2 DEVICE INTEG DEV1 DEV2	Dovice Inspection XTION CHECKS FOR VAL 5 Name of Task Test Brief Personal protective equipment TER Structural Assembly -BOM Fasteners	Engineer or Staff Signature : Description Inform everyone of the last taking place from an all test personnel are wearing the appropriate predictive equipment Ensure that the AR headast is free from Assembly is complete on mixing components. Assembly is complete on mixing fractions of the Components of the Components of the Components. Assembly is complete on mixing fractioned to the vibration machine	Checked	Initials	Date											
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PREOPE	ERATION CHECKS			
	Name of Task	Description	Signature	Date
DEVICE IN	TEGRITY			
DEV1	ASSEMBLY - BOM	Assembly is complete - no missing components.		
DEV2	ASSEMBLY - FASTENERS	All fasteners torqued per assy dwg		
DEV3	TIRES	Verify tire pressure		
SYSTEM IN	NTEGRITY			
SYS1	FIRE	Measure firewall temperature while engine is operating. Ensure that it is not at a dangerous level for the pilot.		
SYS2	EMERGENCY SHUT DOWN TEST	Kill switch is accessble to operator AND to test crew. TEST kill switch.		
SYS3	STEERING inspect	Verify all connections in load path from pilot input to tires.		
SVSA	BRAKE inspect	Visually inspect all components and connections in brake system		+
	STEERING Test	Vehicle static. Manually load test steering system. Check for play in system.		
	BRAKE Test	Test braking system with vehicle under static load.		1
SAFETY	PROCEDURES	control malfunction plan		-
	PROCEDURES			-
	PROCEDURES	impact contingency plan fire control plan		-
	AUDIBLE ALERT SYSTEM	Vehicle is equipped with audible alert system [minimum a bell]		
	VEHICLE	No sharp edges, harmful components in pilot's way.		T
	GUARDING	Verify that pilot can not directly access any moving parts.		+
SFT7		, , , , , , , , , , , , , , , , , , , ,		+
SFT8		Check extinguisher type Ensure driver reaches fire suppressor easily and can direct fire suppressor towards engine.		-
3519	FIRE	Place vehicle on 20 deg lateral ramp and verify that 2 wheels at the minimum remain in contact		+
	STABILITY	with ground.		
	EGRESS	Verify that pilot can exit vehicle, unaided, in less than 15 seconds.		
	ACCESS TO DRIVER	Verify that crew can remove driver, unaided by driver, in less than 15 seconds.		
	FIELD OF VISION	Verify that pilot has +/- 80 deg view all around. Ensure mirrors are properly installed.		
	PERSONAL PROTECTIVE EQUIPMENT	Seatbelts, helmet, fire suit, proper footwear, gloves.		
	TEST DRIVER	Select best test driver based on skill		
	INFRASTRUCTURE	Secure Danger Zone where testing will occur [pylons, personnel]		
	- RAMP UP			
	STRAIGHT LINE	accelerate to 25%		
	BRAKES	all wheels lock		<u> </u>
SFT18	INSPECTION	fasteners, control hardware and mechanism including turning		
	STRAIGHT LINE	accelerate to 50%		
	BRAKES	all wheels lock		
	INSPECTION	fasteners, control hardware and mechanism including turning		
	STRAIGHT LINE	accelerate to 70%		ļ
	BRAKES	all wheels lock		ļ
	INSPECTION	fasteners, control hardware and mechanism including turning		<u> </u>
	STRAIGHT LINE	accelerate to 80%		1
	BRAKES	all wheels lock		
	INSPECTION	fasteners, control hardware and mechanism including turning		
	STRAIGHT LINE	accelerate to 90%		
	BRAKES	all wheels lock		
	INSPECTION	fasteners, control hardware and mechanism including turning		
	STRAIGHT LINE	accelerate to 100%		
	BRAKES	all wheels lock		
SFT21	INSPECTION	fasteners, control hardware and mechanism including turning		<u> </u>

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PREOPERAT				
	Name of Task	Description	Signature	Date
SAFETY				
SFT1	PROCEDURES	critical failure plan discussed w/ personnel		
SFT2	DANGER ZONE	Danger Zone clearly identified and SECURED.		
SFT3	GUARDING	All access to rotating hazards protected by guards.		
SFT4	FIRE	Fire suppression system in place.		
SFT5	STABILITY	Device is safely anchored		
SFT6	WIRING	Inspect wiring system. Check for ground, lose connections, short circuit risks.		
SFT7	PERSONAL PROTECTIVE EQUIPMENT	Safety glasses, helmets, proper footwear, gloves.		
SFT8	EMERGENCY CONTACT	Staff on call as emergency contact :		
DEVICE INTEGRI				
DEV1	ASSEMBLY - BOM	Assembly is complete - no missing components.		
DEV2	ASSEMBLY - BOM	All fasteners torqued per assy dwg		
SYSTEM INTEGR	ITY			
	ROTATING ASSEMBLY inspect	Inspect all components and connections in rotating assembly.		
SYS2	BRAKE inspect	Visually inspect all components and connections in brake system		
SYS3	BRAKE TEST	test braking force against manual rotation of blades		
SYS4	ROTATING ASSEMBLY static test	Manually load blades in radial and vertical directions. Check for play in system.		
		Executive [staff or EIR] signoff - device may proceed to DYNAMIC TESTS		
		Executive [start of Ent] signori - device may proceed to bitMaivile 12313		
DYNAMIC CHECK				
	ROTATING ASSEMBLY dynamic ramp up	Ramp up RPM and check system at 5,10,20,50,75,100% Max RPM.		
DYN1	5%	accelerate to 5% of max rpm		
DYN2		expected duration : 5 minutes		
	BRAKES	blades stop		
	INSPECTION	verify fasteners, control hardware and fixation points		
DYN5	10%	accelerate to 10% of max rpm		
DYN6		expected duration : 5 minutes		
	BRAKES	blades stop		
	INSPECTION	verify fasteners, control hardware and fixation points		
DYN9	20%	accelerate to 20% of max rpm		
DYN10		expected duration : 3 minutes		
DYN11		blades stop		
DYN12	INSPECTION	verify fasteners, control hardware and fixation points		
DYN13	50%	accelerate to 50% of max rpm		
DYN14		expected duration : 1 minutes		
DYN15		blades stop		
	INSPECTION	verify fasteners, control hardware and fixation points		
DYN17	75%	accelerate to 75% of max rpm		
DYN18		expected duration : 0.5 minutes		
DYN19		blades stop		
	INSPECTION	verify fasteners, control hardware and fixation points		
DYN21	100%	accelerate to 100% of max rpm		
DYN22		expected duration : 0.25 minutes		
DYN23		blades stop		
DYN24	INSPECTION	verify fasteners, control hardware and fixation points		
		Executive [staff or EIR] signoff - device may proceed to OPERATIONAL TESTS		

Hazard types (ref 2)

movement	stored energy	sharp e	electricity	substances	radiation	physical agents	

Description	Severity	Probability	Corrective or Control Action	Action verified	Implementation Date
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