Team	#9			
Device	Augmented Reality Headset			
Test date	TBD		Approvals for testing	VERSION
Location	Concordia University	Program Manager		1.0
Test LEAD	Faraz Yunus	Professor		
Test co-lead	Nicholas Cierson			
Test STAFF	TBD			
Observers				

ENGINEERING VALIDATION TESTS

	Name of analysis	Description of test	Expected	Observed	Date
VAL1	Steady Force 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 failure occurs	No Failure Occurs		
VAL2	Impact Test	Drop a solid 500g steel ball at the largest unreinfoced area of the AR headset at a height of 1m. (Exclude the screen and the heads up display)	No Failure Occurs		
VAL3	Drop Test	Drop the AR headset at 1m and observe whether device failure occurs	No Failure Occurs		
VAL4	Thermal Test	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		
VAL5	Vibration Test	Vibrate the AR headset in a vibration machine and observe whether the harware comes loose	No Hardware comes Loose		

HAZARD and MISHAP ANALYSIS

Hazard types (ref 2)

	Movement	stored energy	sharp edges	electricity	substances	radiation	physical agents	Description	Severity	Probability	Corrective or Control Action	Action verified	Implementation Date
VAL1		No	Yes	Yes	No	No	No	Danger of flying objects	Medium	Medium	Proper protective equipment worn during test. Fire extinguisher is nearby.		
VAL2		No	Yes	Yes	No	No	No	Danger of flying objects	Medium	Medium			
VAL3		No	Yes	Yes	No	No	No	Danger of flying objects	Medium	High			
VAL4		No	No	Yes	No	No	No	Danger of overheating and causing a fire	Medium	Low			
VAL5		No	No	Yes	No	No	No	Danger of flying objects	Medium	Medium			

PREOPERATION CHECKS FOR VAL 1, VAL 2 and VAL 3

SAFETY

	Name of Task	Description	Checked	Initials	Date
SFT1	Test Brief	Inform everyone of the test taking place (As per standard IEC60950)			
SFT2	Test Procedure	Ensure testers have reviewed standard IEC60950.			
SFT3	Personal Protective Equipment	Ensure all test personnel are wearing the appropriate protective equipment (Safety Glasses)			
SFT4	Projectile	Ensure a barrier is placed to limit the movement of projectiles			
SFT5	Infrastructure				
SFT6	Fire				

DEVICE INTEGRITY

DEV1	Structural	Ensure that the AR headset is free from structural damage			
DEV2	Assembly - BOM	Assembly is complete - no missing components.			

SYSTEM INTEGRITY					
SYS1	shock				
SYS2	vibration				
SYS3	temperature				
SYS4	pressure				
SYS5	other				

INSPECTION

INS1	Device Inspection	Engineer or Staff signature :		

PREOPERATION CHECKS FOR VAL 4

SAFETY

	Name of Task	Description	Checked	Initials	Date
SFT1	Test Brief	Inform everyone of the test taking place (As per standard IEC 60950)			
SFT2	Test Procedure	Ensure testers have reviewed the test procedure			
SFT3	Fire				
SFT4	Personal protective equipment				

DEVICE INTEGRITY

DEV1	Structural	Ensure that the AR headset is free from structural damage			
DEV2	Assembly - BOM	Assembly is complete - no missing components.			
DEV3	Fasteners	Ensure that the AR headset is properly fastened to the windtunnel			

SYSTEM INTEGRITY

SYS1	Temperature	Ensure thermocouples are placed inside of the AR headset			
SYS2	Temperature Output Reader	Ensure that the temperature output reader is functioning properly			
SYS4	vibration				
SYS5	shock				
SYS6	pressure				
SYS7	other				

INSPECTION

INS1	Device Inspection	Engineer or Staff signature :		

PREOPERATION CHECKS FOR VAL 5

SAFETY

	Name of Task	Description	Checked	Initials	Date
SFT1	Test Brief	Inform everyone of the test taking place			
SFT2	Personal protective equipment	Ensure all test personnel are wearing the appropriate protective equipment (Safety Glasses)			
SFT3	Fire				

DEVICE INTEGRITY

DEV1	Structural	Ensure that the AR headset is free from structural damage			
DEV2	Assembly - BOM	Assembly is complete - no missing components.			
DEV3	Fasteners	Ensure that the AR headset is properly fastened to the vibration machine			

SYSTEM INTEGRITY

SYS1	Vibration	Ensure that the vibration machine is woking			
SYS2	Kill Switch	Ensure that the kill switch for the vibration machine is free of obstruction and operational. TEST			
SYS3	shock				
SYS4	temperature				
SYS5	pressure				
SYS6	other				

INSPECTION

INS1	Device Inspection	Engineer or Staff signature :	

COMMENTS

References
1 MIL-STD-882D
2 Safey with Machinery, John Ridley and Dick Pearce, 2006

BASIC SET OF VEHICLE CRITERIA

PREOPERATION CHECKS

	Name of Task	Description	Signature	Date
DEVICE INTEGRITY				
DEV1	ASSEMBLY - BOM	Assembly is complete - no missing components.		
DEV2	ASSEMBLY - FASTENERS	All fasteners torqued per assy dwg		
DEV3	TIRES	Verify tire pressure		
SYSTEM INTEGRITY				
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.		
SYS4	BRAKE inspect	Visually inspect all components and connections in brake system		
SYS5	STEERING Test	Vehicle static. Manually load test steering system. Check for play in system.		
SYS6	BRAKE Test	Test braking system with vehicle under static load.		
SAFETY				
SFT1	PROCEDURES	control malfunction plan		
SFT2	PROCEDURES	impact contingency plan		
SFT3	PROCEDURES	fire control plan		
SFT4	AUDIBLE ALERT SYSTEM	Vehicle is equipped with audible alert system [minimum a bell]		
SFT5	VEHICLE	No sharp edges, harmful components in pilot's way.		
SFT6	GUARDING	Verify that pilot can not directly access any moving parts.		
SFT7	FIRE	Check extinguisher type		
SFT8	FIRE	Ensure driver reaches fire suppressor easily and can direct fire suppressor towards engine.		
SFT9	STABILITY	Place vehicle on 20 deg lateral ramp and verify that 2 wheels at the minimum remain in contact with ground.		
SFT10	EGRESS	Verify that pilot can exit vehicle, unaided, in less than 15 seconds.		
SFT11	ACCESS TO DRIVER	Verify that crew can remove driver, unaided by driver, in less than 15 seconds.		
SFT12	FIELD OF VISION	Verify that pilot has +/- 80 deg view all around. Ensure mirrors are properly installed.		
SFT13	PERSONAL PROTECTIVE EQUIPMENT	Seatbelts, helmet, fire suit, proper footwear, gloves.		
SFT14	TEST DRIVER	Select best test driver based on skill		
SFT15	INFRASTRUCTURE	Secure Danger Zone where testing will occur [pylons, personnel]		
DYNAMIC - RAMP UP				
SFT16	STRAIGHT LINE	accelerate to 25%		
SFT17	BRAKES	all wheels lock		
SFT18	INSPECTION	fasteners, control hardware and mechanism including turning		
SFT19	STRAIGHT LINE	accelerate to 50%		
SFT20	BRAKES	all wheels lock		
SFT21	INSPECTION	fasteners, control hardware and mechanism including turning		
SFT16	STRAIGHT LINE	accelerate to 70%		
SFT17	BRAKES	all wheels lock		
SFT18	INSPECTION	fasteners, control hardware and mechanism including turning		
SFT19	STRAIGHT LINE	accelerate to 80%		
SFT20	BRAKES	all wheels lock		
SFT21	INSPECTION	fasteners, control hardware and mechanism including turning		
SFT16	STRAIGHT LINE	accelerate to 90%		
SFT17	BRAKES	all wheels lock		
SFT18	INSPECTION	fasteners, control hardware and mechanism including turning		
SFT19	STRAIGHT LINE	accelerate to 100%		
SFT20	BRAKES	all wheels lock		
SFT21	INSPECTION	fasteners, control hardware and mechanism including turning		

BASIC SET OF WIND TURBINE CRITERIA

PREOPERATION CHECKS

	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 INTEGRITY				
DEV1	ASSEMBLY - BOM	Assembly is complete - no missing components.		
DEV2	ASSEMBLY - BOM	All fasteners torqued per assy dwg		
SYSTEM INTEGRITY				
SYS1	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		
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		
DYN3	BRAKES	blades stop		
DYN4	INSPECTION	verify fasteners, control hardware and fixation points		
DYN5	10%	accelerate to 10% of max rpm		
DYN6		expected duration : 5 minutes		
DYN7	BRAKES	blades stop		
DYN8	INSPECTION	verify fasteners, control hardware and fixation points		
DYN9	20%	accelerate to 20% of max rpm		
DYN10		expected duration : 3 minutes		
DYN11	BRAKES	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	BRAKES	blades stop		
DYN16	INSPECTION	verify fasteners, control hardware and fixation points		
DYN17	75%	accelerate to 75% of max rpm		
DYN18		expected duration : 0.5 minutes		
DYN19	BRAKES	blades stop		
DYN20	INSPECTION	verify fasteners, control hardware and fixation points		
DYN21	100%	accelerate to 100% of max rpm		
DYN22		expected duration : 0.25 minutes		
DYN23	BRAKES	blades stop		
DYN24	INSPECTION	verify fasteners, control hardware and fixation points		
		Executive [staff or EIR] signoff - device may proceed to OPERATIONAL TESTS		

HAZARD and MISHAP ANALYSIS

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