PI Name:Wood, Scott J. Ph.D.Project Title:Sensorimotor adaptation following exposure to ambiguous inertial motion cuesDivision Name:Human ResearchProgram/Discipline:NSBRIProgram/Discipline:-NSBRISensorimotor Adaptation Team				
Project Tile: Research Diskin Name: Hama Research Program Obicpline: NSBR Program Obicpline: StRI - Scassiniston Adaptation Taum Program Obicpline: NsBR - Scassiniston Adaptation Taum Internet-stable Opticpline: No Internet-stable Opticpline: No Internet-stable Opticpline: No Internet-stable Opticpline: No Stable Opticpline: No	Fiscal Year:	FY 2009	Task Last Updated:	FY 05/12/2010
Division Name Imma Research Program/Discipline: NSBRI String Normalization String S				
Name Name Program/Discipline- Element/Sublic/pline- Sublic/pline- Sublic/pline- Sublic/pline- Element/Sublic/pline- Element/Sublic/pline- Sublic/ Sublic/pline- Sublic/ Subl	Project Title:	Sensorimotor adaptation following exposure to	ambiguous inertial motion cues	
Pergram/Dive/cpline- Ement/Subdicpline- Ement/Subdicpline- Subdica Agency Name: SBRI-Sensorimotor Adaptation Team Joint Agency Name: TechPort: No Human Research Program Risks: (1) HECHaman Health Countermeasures: No Space Biology Ement: None Space Biology Special Category: None Space Biology Special Category: None Space Biology Special Category: None Organization Type: NASA CENTER Phone: (28) 483-6529 Organization Type: NASA Dankon Space Center Space Biology Special Category: Nasa Center PI Andress 2: Mail code SD2 Space Trait Space Congressional District: 36 Organization Type: Hoaton State: TX Of Organization Space Center Space Biology Special Category: Nasa Congressional District: 36 Organization Space Center Space Space Congressional District: 36 Space Space Congressional District: 36 Optica Ladores Group Space Congressional District: 36 Space Space Space Congressional District: 36 Optica Ladores Group Space Congressional District: 36 Space Spac	Division Name:	Human Research		
Element/Subdiscipline: Non-Sensormation Auguitation Frain Jaint Ageory Name: TechPor: No Human Research Program Blein (1) Hunc-Human Health Countermeasures Usersormation-Risk of Alterol Sensorimoty-Vestibular Function Impacting Critical Mission Tasks Space Biology Stemat: None Usersormation-Risk of Alterol Sensorimoty-Vestibular Function Impacting Critical Mission Tasks Space Biology Stemat: None Vestion Tasks Vestion Tasks Space Biology Special Category: None Vestion Tasks Vestion Tasks Pl Gradization Type: NosA CENTER Phone: (281) 483-6329 Vestion Tasks Organization Type: NaSA Johnson Space Center Vestion Tasks Vestion Tasks Pl Addres S1: Malored SD2 Vestion Tasks Vestion Tasks Pl Addres S1: Malored SD2 Vestion Tasks Vestion Tasks Pl Addres S1: Malored SD2 Vestion Tasks Vestion Tasks Pl Addres S1: Malored SD2 Vestion Tasks Vestion Tasks Pl Addres S1: Malored SD2 Vestion Tasks Vestion Tasks Pl Addres S1: Molored SD2 Vestion Tasks Vestion Tasks Pl Addres S1:	Program/Discipline:	NSBRI		
Human Research Program Elden O) HITC-Human Idealth Countermeasures Human Research Program Risks O) Sensorimotor-Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks Space Biology Coss-Eldence None Space Biology Special Category None PI Email: centi, wood Grinnas agov Fax: FY PI Organization Type: NASA CENTER Phone: (281) 483-6329 Organization Type: NASA Johnson Space Cancell Fax: FY PI Adress 1: Coll NASA Parkway Fax: FX PI Adress 1: Stal Advances Fax: FX PI Adress 1: Coll NASA Parkway Fax: FX PI Adress 1: Coll NASA Parkway Fax: FX PI Adress 1: Matiode SD2 Fax: FX Child Cancell Staticaticaticaticaticaticaticaticaticati		NSBRISensorimotor Adaptation Team		
Human Research Program Risks: (1) Seasorimotor-Risk of Allered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks Space Biology Cross-Element None Space Biology Special Category: None PI Gending Special Category: None PI Enail: centi, viceoliginas gov Fax: FY PI Organization Type: NASA CENTER Phone: (281) 483-6329 Organization Name: NASA Johnson Space Center PI Address 1: Mail code SD2 PI Web Page:	Joint Agency Name:		TechPort:	No
Space Biology Element:NeneSpace Biology Cross-Element Discipline:NoneSpace Biology Special Category:NoneP Lemail:secti, voord/masa.govFa:P Lemail:secti, voord/masa.govFa:P More:CB1 Moson Space CenterP I Adress 1:Old NASA ParkwayP I Adress 1:Old NASA ParkwayP More:Mailoods SD2P More:Mailoods SD2P More:Mailoods SD2P More:Noson Space CenterCity:Mason Space CenterCity:Noson Space CenterP More:Noson Space CenterP More:Noson Space CenterP More:Noson Space CenterP More:Noson Space CenterP More:Nasion Space CenterP More:Noson Space CenterCity:Noson Space CenterP More:Noson Space CenterP More:Noson Space CenterP More:Noson Space CenterNoson:Noson Space CenterSpace Biology Space CenterNoson Space CenterP More:Noson Space CenterNoson:Noson Space CenterNoson:Noson Space ConterNoson:Noson Space ConterNoson:Noson Space ConterNoson:Noson:Noson:Noson Space Conter <t< td=""><td>Human Research Program Elements:</td><td>(1) HHC:Human Health Countermeasures</td><td></td><td></td></t<>	Human Research Program Elements:	(1) HHC :Human Health Countermeasures		
None Space Biology Cross-Element Discipline: None Space Biology Special Category: None PI Email: sociLiveodifinass.gov; Fax: FY PI Organization Type: NASA Johnson Space Center (281)483-6329 Organization Name: NASA Johnson Space Center (281)483-6329 PI Address 1: 2010 NASA Parkway	Human Research Program Risks:	(1) Sensorimotor: Risk of Altered Sensorimoto	r/Vestibular Function Impacting	Critical Mission Tasks
Discipline: None Space Biology Special Category: None PI Email: codi, iwoad/masa, gov Fax: FY PI Organization Type: NASA CENTER Phone: (281) 483-6329 Organization Type: NASA CENTER (281) 483-6329 Organization Name: NASA CENTER (281) 483-6329 PI Address 1: NASA CENTER (281) 483-6329 Organization Name: NASA CENTER (281) 483-6329 PI Address 1: NASA Parkons Seconter Pi Address 1: Nail code SD2 Seconter Pi Address 1: Nail code SD2 Seconter Pi Ocio: Nosfon Salicitation / Paus at Azasa Pacific University from August 2013 - January Pi Ocio: Pi Organization No, Or	Space Biology Element:	None		
PI Enail:exit.i wood/ania.govFix:FYP1 Organization Type:NASA CENTERPhone:(281) 483-6329Organization Name:NASA Johnson Space CenterP1 Address I:2101 NASA ParkwayP1 Address 2:Mail code SD2P1 Web Page:State:TXCliy:MoustonState:TX20 Organization Xing:NOTE:Pretrumed to NASA JSC in January 2017. Plawas at Azasa Pacific University from August 2013 – January20 OrganizationSolicitation / Funding Non Type was at NASA JSC.RAcA3-OBBR-0420 OrganizationSolicitation / Source No of Past Dearce:020 OrdaRobatic:0/28/200920 OrdaNo. of Past Dearce:020 Address:0No. of Past Dearce:20 Address:0No. of Bachelor's Degress:020 Address:0No. of Bachelor's Degress:220 Address:No. of Bachelor's Degress:2220 Address:No. of Bachelor's Degress:2220 Address:No. of Bachelor's Degress:2220 Address:No. of Bachelor's Degress:2 <td< td=""><td></td><td>None</td><td></td><td></td></td<>		None		
Nakaa Cemmen Phome: (2k1) 483-6329 Organization Name: NASA So Center P1 Address 1: 101 NASA Parkway P1 Address 2: Mail code SD2 P1 Web Page: Tomas State: TX City: Houson State: TX Zip Code: 7058 Congressional District: 3 Comments: S017: P1 returned to NASA JSC in January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University Conduct 2017. P1 was at Azuse Pacific University from August 2013 - January 2017. P1 was at Azuse Pacific University Conduct 2017. P1 was at Azuse Paci	Space Biology Special Category:	None		
Companization of the service	PI Email:	scott.j.wood@nasa.gov	Fax:	FY
Pi Address 1: 2101 NASA Parkway Pi Address 1: Mail code SD2 Pi Web Page: Image: City: Houston State: TX 2ip Code: 7058 Congressional District: 36 Comments: NOTE: PI returned to NASA JSC in January 2017. PI was at Azusa Pacific University from August 2013 – January 2017; prior to August 2013, PI was at NASA JSC. Project Type: Ground Solicitation / Funding NRA-03-OBPR-04 Start Date: 09/01/2004 End Date: 02/28/2009 No. of Post Docs: 0 No. of Master' Degrees: 0 No. of PbD Candidates: 2 No. of Master' Degrees: 0 No. of Master' S Candidates: 0 No. of Bachelor's Degrees: 2 No. of Bachelor's Candidates: 0 No. of Bachelor's Degrees: 2 No. of Bachelor's Candidates: 0 No. of Bachelor's Degrees: 2 Contact Monitor: Contact Phone: Contact Phone: Flight Assignment: NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (107/08) Key Personnel Changes/Previous PI: Flight Assignment: Norte: Kenter National de la Recherche Scientifique) Ground: Imm. Debordi (NASA JSC) Imm. Debordi (NASA JSC) Imm. Debordi (NASA JSC) </td <td>PI Organization Type:</td> <td>NASA CENTER</td> <td>Phone:</td> <td>(281) 483-6329</td>	PI Organization Type:	NASA CENTER	Phone:	(281) 483-6329
PI Address 2: Mail code SD2 PI Web Page: Isoson City: Mouston Stat: TX Sig Code: 7058 Comments: SofTE: PI returned to NASA JSC in January 2017. PI was at Azusa Pacific University from August 2013 – January 2017; prior to August 2013 – PI was at AXSA JSC. Project Type: Ground Solicitation / Funding Source: Start Date: 0901/2004 End Date: 028/2009 No. of PAD Decres: 0 No. of PAD Degrees: 0 No. of PAD Candidates: 0 No. of Bachelor's Degrees: 0 No. of Bachelor's Candidates: 0 No. of Bachelor's Degrees: 0 Contact Email:	Organization Name:	NASA Johnson Space Center		
Pit Web Page: City: Moston Stat: TX 2ip Code: 7058 Congressional Dist: 36 comments: SofTE: PI returned to NASA JSC in January 2017. PI was at Azusa Pacific Withow 2013 – January 2017; prior to August 2013, PI was at NASA JSC. Moston 2003 Project Type: Ground Solicitation / Fundi B RA-03-OBPR-04 Start Date: 901/2004 End Date: 028/2009 No. of Pob Decs: 0 No. of PhD Degres: 0 No. of Pob Condidates: 0 No. of Master's Degres: 0 No. of Master's Candidates: 0 No. of Bachelor's Degres: 2 No. of Master's Candidates: 0 Moniforing Cenet No. SRI Contact Email:	PI Address 1:	2101 NASA Parkway		
City:HoustonState:TXZip Code:70058Congressional District:36Comments:NOTE:Preturned to NASA JSC in January 2017. PI was at Azusa Pacific University from August 2013 – January 2017; prior to August 2013, PI was at NASA JSC.Project Type:GroundSolicitation / Funding Source:NAc03-OBPR-04Start Date:0901/2004End Date:02/28/2009No. of Post Does:0No. of PhD Degrees:0No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Bachelor's Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Flight Arongan:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (107/08)Series Series Ser	PI Address 2:	Mail code SD2		
Zip Code:77058Congressional District:36Comments:NOTE: PI returned to NASA JSC in January 2017. PI was at Azusa Pacific University from August 2013 – January 2017; prior to August 2013, PI was at NASA JSC.Project Type:GroundSolicitation / Funding Source:NRA-03-OBPR-04Start Date:09/01/2004End Date:0/28/2009No. of Post Docs:0No. of PhD Degrees:0No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Bachelor's Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Contact Email:Image: Source:Image: Source:Image: Source:Flight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Image: Source:Key Personnel Changes/Previous PIClement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Acrospace Medical Research Laboratory)Image: Source:Grant/Contract No.:NC 9-58-NA00405Image: Source:Image: Source:Profermance Goal No.:Image: Source:Image: Source:Image: Source:	PI Web Page:			
Comments:NOTE: PI returned to NASA JSC in January 2017. PI was at Azusa Pacific University from August 2013 – January 2017; prior to August 2013, PI was at NASA JSC.Project Type:GroundSolicitation / Funding SourceeNRA-03-OBPR-04Start Date:09/01/2004End Date:0/2/28/2009No. of Post Docs:0No. of PhD Degrees:0No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Bachelor's Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Contact Email:VVVFlight Program:VVVFlight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (107/08)VKey Personnel Changes/Previous PI:Contact Masier, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)VGrant/Contract No.:NC 9-58-NA00405VPerformance Goal No.:VV	City:	Houston	State:	TX
Continuents:2017; prior to August 2013, PI was at NASA JSC.Project Type:GroundSolicitation / Funding Source:NRA-03-OBPR-04Start Date:09/01/2004End Date:02/28/2009No. of Post Docs:0No. of PhD Degrees:0No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Master' Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Contact Email:Vorte: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Flight Program:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Key Personnel Changes/Previous PI:Larm, Deborah (NASA JSC) Rupert, Angus (Naval Aerospace Medical Research Laboratory)Grant/Contract No.:NCC 9-58-NA00405Performance Goal No.:NCC 9-58-NA00405	Zip Code:	77058	Congressional District:	36
Start Date:09/01/2004End Date:02/28/2009No. of Post Docs:0No. of PhD Degrees:0No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Bachelor's Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Contact Email:Flight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)-Key Personnel Changes/Previous PI:Col Name (Institution):Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)-Grant/Contract No.:NCC 9-58-NA00405	Comments:			versity from August 2013 – January
No. of Post Does:0No. of PhD Degrees:0No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Bachelor's Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Contact Email:Flight Program:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)-Key Personnel Changes/Previous PI:Col Name (Institution):Harm, Deborah (NASA JSC) Cement, Gilles (Centre National de la Recherche Scientifique) yupert, Angus (Naval Aerospace Medical Research Laboratory)-Grant/Contract No.:NCC 9-58-NA00405	Project Type:	Ground	Solicitation / Funding Source:	NRA-03-OBPR-04
No. of PhD Candidates:2No. of Master' Degrees:0No. of Master's Candidates:0No. of Bachelor's Degrees:2No. of Bachelor's Candidates:6Monitoring Center:NSBRIContact Monitor:Contact Phone:Contact Phone:Contact Email:IIFlight Program:IIFlight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Key Personnel Changes/Previous PI:IColl Name (Institution):Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)Grant/Contract No.:NCC 9-58-NA00405	Start Date:	09/01/2004	End Date:	02/28/2009
No. of Master's Candidates:0No. of Bachelor's Degrees: 2No. of Bachelor's Candidates:6Monitoring Center: NSBRIContact Monitor:Contact Phone:Contact Email:-Flight Program:-Flight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Key Personnel Changes/Previous PI:Coll Name (Institution):Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)Grant/Contract No.:NCC 9-58-NA00405	No. of Post Docs:	0	No. of PhD Degrees:	0
No. of Bachelor's Candidates:6Monitoring Center: NSBRIContact Monitor:Contact Phone:Contact Email:Contact Phone:Flight Program:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Flight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Key Personnel Changes/Previous PI:Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)Grant/Contract No.:NCC 9-58-NA00405Performance Goal No.:VCC 9-58-NA00405	No. of PhD Candidates:	2	No. of Master' Degrees:	0
Contact Monitor:Contact Phone:Contact Email:Flight Program:Flight Assignment:NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08)Key Personnel Changes/Previous PI:COI Name (Institution):Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)Grant/Contract No.:NCC 9-58-NA00405Performance Goal No.:	No. of Master's Candidates:	0	No. of Bachelor's Degrees:	2
Contact Email: Flight Program: Flight Assignment: NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08) Key Personnel Changes/Previous PI: Col Name (Institution): Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory) Grant/Contract No.: NCC 9-58-NA00405 Performance Goal No.: Verformance Goal No.:	No. of Bachelor's Candidates:	6	Monitoring Center:	NSBRI
Flight Program: NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08) Key Personnel Changes/Previous PI: Image: Contract No.: COI Name (Institution): Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory) Grant/Contract No.: NCC 9-58-NA00405 Performance Goal No.: VCC 9-58-NA00405	Contact Monitor:		Contact Phone:	
Flight Assignment: NOTE: End date changed to 2/28/2009, from 8/31/2008, per NSBRI (10/7/08) Key Personnel Changes/Previous PI: Harm, Deborah (NASA JSC) COI Name (Institution): Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory) Grant/Contract No.: NCC 9-58-NA00405 Performance Goal No.: VCC 9-58-NA00405	Contact Email:			
Fingit Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory) Grant/Contract No.: NCC 9-58-NA00405 Performance Goal No.: VCC 9-58-NA00405	Flight Program:			
COI Name (Institution):Harm, Deborah (NASA JSC) Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory)Grant/Contract No.:NCC 9-58-NA00405Performance Goal No.:	Flight Assignment:	NOTE: End date changed to 2/28/2009, from 8	/31/2008, per NSBRI (10/7/08)	
COI Name (Institution): Clement, Gilles (Centre National de la Recherche Scientifique) Rupert, Angus (Naval Aerospace Medical Research Laboratory) Grant/Contract No.: NCC 9-58-NA00405 Performance Goal No.: VCC 9-58-NA00405	Key Personnel Changes/Previous PI:			
Performance Goal No.:	COI Name (Institution):	Clement, Gilles (Centre National de la Reche		
	Grant/Contract No.:	NCC 9-58-NA00405		
Performance Goal Text:	Performance Goal No.:			
	Performance Goal Text:			

	The central nervous system must resolve the ambiguity of inertial motion sensory cues in order to derive accurate spatial orientation awareness. Our general hypothesis is that the central nervous system utilizes both multi-sensory integration and frequency segregation as neural strategies to resolve the ambiguity of tilt and translation stimuli. Movement in an altered gravity environment, such as weightlessness without a stable gravity reference, results in new patterns of sensory cues. Adaptive changes in how inertial cues from the otolith system are integrated with other sensory information lead to perceptual and postural disturbances upon return to Earth's gravity. The primary goals of this ground-based research investigation were to explore physiological mechanisms and operational implications of disorientation and tilt-translation disturbances reported by crewmembers during and following re-entry, and to evaluate a tactile prosthesis as a countermeasure for improving control of whole-body orientation during passive tilt and translation motion paradigms. Aim 1 was to examine the effects of stimulus frequency (0.01 - 0.6 Hz) on adaptive changes in eye movements, motion perception and cognition during combined tilt and translation motion profiles. We hypothesized that adaptation of otolith-mediated responses will be greatest in the mid-frequency range where there is a tilt-translation crossover. Our findings emphasized differences in the neural processing to distinguish tilt and translation between eye movements and motion perception. Specifically, during dynamic linear stimuli in the absence of canal and visual input, a change in stimulus frequency over this limited range. Our findings also suggest that the frequency at which there was a crossover of perceived tilt and translation gains appeared to vary across different motion paradigms (e.g., near 0.3 Hz during off-vertical axis rotation and near 0.15 Hz during sled translation).		
Task Description:	Adaptation experiments conducted below this cross-over frequency using the 'vision-aligned' paradigm have resulted in modest changes to both eye movements and motion perception, consistent with our first hypothesis. Adaptation experiments conducted around this cross-over frequency range using the 'GIF-aligned' paradigm demonstrated a significant effect of stimulus frequency on both motion sickness and spatial cognitive performance.		
	Aim 2 was to examine changes in control errors during a closed-loop nulling task before and after tilt-translation adaptation. We hypothesized that the ability to control tilt orientation will be compromised following tilt-translation adaptation, with increased control errors corresponding to changes in self-motion perception. Roll tilt nulling was implemented using the both step and pseudorandom stimuli in darkness. Our findings suggest that these types of manual control tasks are sensitive to underlying changes in sensorimotor physiology, and specifically to changes in the brain's interpretation of linear acceleration stimuli.		
	Aim 3 was to evaluate how a tactile prosthesis might improve control performance. A simple 4 electromechanical tactor system was developed that provided 6 threshold levels of orientation information. We also examined the influence of vibrotactile feedback during computerized posturography. A significant reduction in RMS error (p <0.05) was observed using this simple tactile prosthesis, both during manual and balance control tasks. These results are promising in that a fairly simple device with as few as 4 tactors may prove useful to significantly improve landing performance.		
	Aim 4 was to examine how spatial awareness is impaired with changing gravitational cues during parabolic flight, and the extent to which vibrotactile feedback of orientation can be used to help improve spatial awareness. Our findings suggest that tactile cueing may improve navigation in operational environments, such as extravehicular activities on a lunar surface. This type of sensory feedback may also prove beneficial as a navigation aid in patient populations, providing non-visual, non-auditory feedback of orientation or desired direction heading.		
Rationale for HRP Directed Research:			
Research Impact/Earth Benefits:	This project provides insight into adaptive mechanisms of otolith function, in particular as they relate to one's perception of motion and cognitive function. The results of this study are relevant therefore to vestibular pathophysiology, and understanding compensatory processes following loss or disruption of otolith function in clinical applications. The closed-loop nulling tasks employed by our experiment team provides a new means of addressing the functional implications of vestibular loss, for example, characterizing risks associated with civilian piloting or automobile driving following vestibular loss. Finally, the development of simple tactile displays is applicable to balance prosthesis applications for vestibular loss patients and the elderly to mitigate risks due to falling or loss of orientation.		
Task Progress:	During the final year of the grant we completed three major studies. The first study compared roll-tilt and lateral translation motion perception in 12 subjects across four different motion paradigms: Off-Vertical Axis Rotation, Variable Radius Centrifugation, Earth-horizontal Axis Rotation, and Lateral Sled Translation. The second study utilized a Tilt-Translation Sled as a space-flight sensorimotor analog to examine adaptive changes following exposure to conflicting tilt-translation stimuli. Fourteen subjects were tilted within a lighted enclosure that simultaneously translated at one of 3 frequencies. Each subject participated in 6 sessions including a familiarization session, passive pitch at 0.15, 0.3 and 0.6 Hz and roll at 0.3 Hz, and active pitch at 0.3 Hz. A new spatial cognitive test was developed from previous match-to-sample and mental rotation tasks. The third study utilized parabolic flight to examine acute changes in spatial navigation during the weightless phase. Six student researchers participated on the Reduced Gravity Student Program, using a virtual spatial navigation task during parabolic flight and during baseline ground tests. In both the sled and parabolic analog studies, vibrotactile feedback was implemented as a sensory countermeasure to improve spatial awareness.		
Bibliography Type:	Description: (Last Updated: 06/03/2025)		
Articles in Peer-reviewed Journals	Holly JE, Wood SJ, McCollum G. "Phase-linking and the perceived motion during off-vertical axis rotation." Biol Cybern. 2010 Jan;102(1):9-29. <u>PMID: 19937069</u> , Jan-2010		
	Wood SJ, Reschke MF, Sarmiento LA, Clément G. "Tilt and translation motion perception during off-vertical axis		

Articles in Peer-reviewed Journals	Clément G, Beaton KH, Reschke MF, Wood SJ. "Effects of motion paradigm on human perception of tilt and translation." Sci Rep. 2022 Jan 26;12(1):1430. <u>https://doi.org/10.1038/s41598-022-05483-6</u> ; <u>PMID: 35082357</u> ; <u>PMCID: PMC8792002</u> , Jan-2022
NASA Technical Documents	Wood SJ. "Reduced gravity education flight program." Houston, Tex. : NASA Lyndon B. Johnson Space Center, p., 27-28, 2009. , Dec-2009
Papers from Meeting Proceedings	Clement G, Harm, DL, Rupert AH, Beaton KH, Wood SJ. "Ambiguous tilt and translation motion cues in astronauts after space flight." Human Research program Investigators' Workshop, League City, Tex, February 2-4, 2009. Human Research Program Investigators' Workshop, 2009. Feb-2009
Significant Media Coverage	Myers C. "What's a sensor belt? Three-part news story on the NSBRI student project on the parabolic flight program." KTRK-TV, Houston, Texas, April 2009., Apr-2009
Significant Media Coverage	Jeffs B. "Scientist probes workings of the inner ear." JSC Roundup , p. 10-11, Vol 47, No 8, August 2008., Aug-2008