Fiscal Year:	FY 2010	**Task Last Updated:**	FY 12/22/2009
PI Name:	Sa, Rui Carlos Ph.D.		
Project Title:	Variability in Flow Distribution within the Lung and its Effects on Deposition and Clearance of Inhaled Particles in Normal and Reduced Gravity		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Human Factors and Performance Team		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **SHFH**:Space Human Factors & Habitability (archival in 2017)		
Human Research Program Risks:	(1) **Dust**:Risk of Adverse Health and Performance Effects of Celestial Dust Exposure		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	92093-0852	**Congressional District:**	53
Comments:	Last name ometimes seen as “Pereira de Sa” "		
Project Type:	GROUND	**Solicitation / Funding Source:**	2009 NSBRI-RFA-09-01 Postdoctoral Fellowships
Start Date:	11/01/2009	**End Date:**	10/30/2011
No. of Post Docs:	1	**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Prisk, G. Kim (MENTOR/University of California, San Diego)		
Grant/Contract No.:	NCC 9-58-PF02103		
Performance Goal No.:			
Performance Goal Text:			
	POSTDOCTORAL FELLOWSHIP The goal of this project to provide a better understanding of how variability in convective flow patterns in the lung affects aerosol deposition, and thus subsequent clearance between individuals. Such an understanding will allow better characterization of the normal variability in deposition and clearance rates both in Earths gravity, and in low-gravity such as on the lunar surface. Three key factors define the toxicological risk to the lung of exposure to airborne lunar dust which is believed to be highly reactive: 1. The degree of deposition; 2. The toxicological properties of the material itself, and; 3. The residence time within the lung of the particles once they have been deposited.		

Task Description:	The distribution of ventilation within the lung determines deposition and subsequent clearance. Previous studies using computational fluid dynamics in realistic central airway trees show that ventilation varies widely at the lobar bronchiole level. However, typical boundary conditions for deposition simulations assume that lung expansion is uniform, which we know to be incorrect. This group has developed a MRI technique that allows the quantification of regional specific ventilation in the human lung providing realistic boundary conditions and an accurate prediction of particle deposition. Specific Aims 1. Map the spatial pattern of specific ventilation, and; 2. Map deposition in the supine position at Earths gravity; and combine these with data on the spatial pattern of deposition of inhaled particles collected in low-gravity as part of Dr. Prisk's existing NSBRI studies. The measured pattern of aerosol deposition will be compared with the computational fluid dynamics predictions, using uniform and the more realistic boundary conditions. By comparing across a number of subjects, the mechanisms underlying the observed variability in deposition and regional ventilation can be elucidated. By comparing the data collected in Earth's gravity with data from low-gravity, the magnitude of the gravitational effect can be assessed.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2010.
Bibliography Type:	Description: (Last Updated: 01/11/2021)