Fiscal Year:	FY 2006	**Task Last Updated:**	FY 05/03/2011
PI Name:	Sandridge, Chris Ph.D.		
Project Title:	Integrated Radiation Analysis and Design Tools		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Radiation health		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **SR**:Space Radiation		
Human Research Program Risks:	(1) **ARS**:Risk of Acute Radiation Syndromes Due to Solar Particle Events (SPEs) (2) **Cancer**:Risk of Radiation Carcinogenesis (3) **CNS**:Risk of Acute (In-flight) and Late Central Nervous System Effects from Radiation Exposure (4) **Degen**:Risk of Cardiovascular Disease and Other Degenerative Tissue Effects From Radiation Exposure and Secondary Spaceflight Stressors		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Web Page:			
City:	Hampton	**State:**	VA
Zip Code:	23681-2199	**Congressional District:**	1
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	Directed Research
Start Date:	10/01/2005	**End Date:**	03/31/2012
No. of Post Docs:		**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:**	NASA LaRC
Contact Monitor:	Cucinott1a, Francis	**Contact Phone:**	281-483-0968
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Badavi, Francis (Christopher Newport University) Blattnig, Steve (NASA Langley Research Center) Clowdsley, Martha (NASA Langley Research Center) Qualls, Garry (NASA Langley Research Center) Simonsen, Lisa (NASA Langley Research Center) Singleterry, Robert (NASA Langley Research Center) Slaba, Tony (NASA Langley Research Center) Zapp, Neal (NASA Johnson Space Center)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The Integrated Radiation Analysis and Design Tools Project develops and maintains an integrated tool set that collects the current best practices, databases, and state-of-the-art methodologies to evaluate and optimize human systems such as spacecraft, spacesuits, rovers, and habitats. Integrates design models & methodologies in support of evaluation/verification of design limits and design solutions to meet As Low As Reasonably Achievable (ALARA) requirements (NASA STD 3001, Vol 2). IRADT provides radiation community access to physics and transport research improvements. Under configuration management with IV&V. Current customers include ESMD's Directorate Integration Office studies (i.e. LAT, MAT, LSOS); Lunar Surface Systems as well as Constellation's Orion and Vehicle Integration Office, Universities, industry, and SBIRs. Partner with JSC for independent verification and validation. IRADT Designed for utilization by future commercial customers concerned about transfer of proprietary data and results. Deliverables and access to the Integrated Radiation Design Tools fills identified gaps documented in the HRP Integrated Research Plan (HRP-47065, Rev. A) to support the evaluation of effective shielding options by the engineering community: • Cancer - 11: What are the most effective shielding approaches to mitigate cancer risks? • Cancer - 13: What are the most effective approaches to integrate radiation shielding analysis codes with collaborative engineering design environments used by spacecraft and planetary habitat design efforts? • Acute - 6: What are the most effective shielding approaches to mitigate acute radiation risks, how do we know, and implement? The design tools methods will specifically address the limitations associated with simplified geometry description (equivalent aluminum, three-layer transport interpolation, random orientation) and straight ahead transport. The design tools increases fidelity by incorporating common spacecraft and user specified materials in the geometry description with ray-by-ray transport to minimize the uncertainties due to range-scaling of material thicknesses and material ordering. Ray-by ray transport also establishes the basis to calculate the forward/backward neutron generation within vehicle/lunar surface geometries. The back-scattered neutron environment will be calculated from the opposite sides of the vehicle for a crew member’s specific orientation at specific tissue locations. This will increase our ability to evaluate the effectiveness of shielding systems. In supporting the closure of these gaps, the Design Tool Project tools and models will support specification, implementation, verification, and monitoring of Spaceflight Human Systems Standard, Vol. 2 (NASA STD 3001, Vol. 2) radiation design and operational requirements with improved uncertainty quantification.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2006. [Ed. note: added to Task Book 5/3/2011 when received project information]
Bibliography Type:	Description: (Last Updated: 09/07/2020)