Fiscal Year:	FY 2007	**Task Last Updated:**	FY 04/28/2009
PI Name:	Allen, Christopher S M.S.		
Project Title:	Space Craft Internal Acoustic Environment		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Space Human Factors Engineering		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **SHFH**:Space Human Factors & Habitability (archival in 2017)		
Human Research Program Risks:	(1) **Hab**:Risk of an Incompatible Vehicle/Habitat Design (2) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Houston	**State:**	TX
Zip Code:	77058	**Congressional District:**	22
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	Directed Research
Start Date:	10/02/2006	**End Date:**	09/30/2010
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 JSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Chu, S. Reynold (Lockheed/NASA Johnson Space Center)		
Grant/Contract No.:			
Performance Goal No.:			
Performance Goal Text:			
	Acoustic modeling can be used to identify key noise sources, determine/analyze sub-allocated requirements, keep track of the accumulation of minor noise sources, and to predict vehicle noise levels at various stages in the development, first with estimates of noise sources, later with experimental data. Bench testing of isolated systems alone is not sufficient as the installation effects are often not known. Acoustic modeling will be used to determine installation effects, reverberation (room geometry) effects, and will be used to identify propagation paths and possible noise controls, as well as develop an understanding of the resulting acoustic levels in the composite environment. Finally, acoustic modeling will be used to assist with the development and implementation of spaceflight acoustic materials and to predict their effectiveness including sound containment, absorption and vibration isolation. Prior to this project, NASA did not have institutional acoustic modeling capability in regards to space flight vehicles. Through this project, acoustic		

Task Description:	modeling capability is being developed for application to the Cx Program and its new spaceflight vehicles to ensure a sufficiently quiet environment in which the astronaut crews can work and live. In general, modern acoustic modeling techniques such as Statistical Energy Analysis (SEA), Ray-tracing techniques, and Finite Element Methods have been used effectively to reduce interior noise in automotive, aircraft, and some spacecraft designs. Each method has its own strengths depending on the type of noise being modeled and the assumptions used, but it is clear that these methods have been effective; automotive and aircraft noise levels have been substantially reduced in recent years. Also, the continued development, current sophistication, and rising sales of off-the-shelf acoustic modeling software are indicative of their applicability and success, otherwise the companies that build automobiles and aircraft would not purchase these. See reference 1 for a recent article describing the state of the art in acoustic modeling capabilities, including off-the-shelf acoustic modeling software tools. The objective of this project will be to develop an acoustic modeling capability, based on off-the-shelf software, to be used as a tool for oversight of the future manned Constellation vehicles to ensure compliance with acoustic requirements and thus provide a safe and habitable acoustic environment for the crews. During FY'07, the project's first year, this project: 1. Determined the acoustic modeling requirements for Constellation vehicles, in terms of frequency range, source type, and model type, and leased an off-the-shelf software package that is well-suited for the modeling task. 2. Developed a simple-geometry acoustic model and validated the model using a physical mockup and acoustic measurements. Tools for modeling the effects of absorptive wall treatments and the resulting reverberation environment were developed as part of this work. Limitations of the modeling technique were also investigated and documented.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2007.
Bibliography Type:	Description: (Last Updated: 08/31/2018)