Fiscal Vear	EV 2007	Task Last Undated	FX 03/20/2007
PI Name:	Chylack, Leo M.D.	Task Last Opuated.	1105/20/2007
	Precise Assessment of Prevalence and Progressic	on of Lens Opacities in Astronauts as	a Function of Radiation Exposure
Project Title:	During Space Flight and Development of Improv	red Routine Clinical Assessment of C	Deular Lens Status
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline Element/Subdiscipline:	HUMAN RESEARCHRadiation health		
Joint Agency Name:		TechPort:	No
Human Research Program Elements:	(1) SR :Space Radiation		
Human Research Program Risks:	(1) Cardiovascular :Risk of Cardiovascular Ada Outcomes	ptations Contributing to Adverse Mi	ssion Performance and Health
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	leo@chylackinc.com	Fax:	FY 781-934-2747
PI Organization Type:	UNIVERSITY	Phone:	617-732-7355
Organization Name:	Harvard Medical School, Brigham & Women's H	Iospital	
PI Address 1:	Center for Opthalmic Research		
PI Address 2:	221 Longwood Ave., EBRC 323		
PI Web Page:			
City:	Boston	State:	MA
Zip Code:	02115	Congressional District:	8
Comments:	If I am not available at 617-732-7355, my office changed to leo@chylackinc.com on 8/23/12]	number, please call 781-934-5052, r	ny home number. [Ed. note: email
Project Type:	Ground	Solicitation / Funding Source:	Directed Research
Start Date:	01/27/2003	End Date:	08/31/2008
No. of Post Docs:	0	No. of PhD Degrees:	1
No. of PhD Candidates:	1	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:		Contact Phone:	
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: Received NCE to 8/31/2008 per JSC (11/07) NOTE: End date changed back to 01/27/2008 per S. Krenek/JSC (8/07)		
	End date changed to 3/31/2008 per JSC info update (10/06)		
Key Personnel Changes/Previous PI:	In July, 2006 after providing excellent optometric backup to the NASCA study the optometrists in Space Center Eye Associates left the project and were replaced by two new optometrists, Robert Gibson, O.D. and Jung Choi, O.D. The transition was a smooth one. Training in the standardized techniques of the routine eye examination for astronauts was provided, and training and certification in HIPAA and LOCS III classification were provided. The new optometrists have maintained the pace of the project. In the fall of 2006 for three months Cynthia Bell, M.S assisted Alan H. Feiveson, Ph.D. in the statistical analyses for the two NASCA manuscripts submitted to Archives of Ophthalmology in December, 2006. She then went onto a faculty position in academe. NASCA Administrative Assistant, Ms. Evelyn Hernandez left the BWH and the project in mid-2006 and was replaced by Ms. Nancy Leslie. This transition was also smooth and non-disruptive.		

COI Name (Institution):	Cucinotta, Francis (NASA Johnson Space Center) Feiveson, Al (NASA) Wear, Mary (Wyle Labs, NASA) Peterson, Leif (Resigned from Baylor College of Medicine in January 2007. Now at The Methodist Hospital in Houston, TX)	
Grant/Contract No.:	NAG9-01491	
Performance Goal No.:		
Performance Goal Text:		
Task Description:	The NASA Study of Cataract in Astronauts (NASCA) is a cross-sectional and longitudinal five-year epidemiological study of the risk factors associated with cataract severity and progression in the whole population of American astronauts and two control populations – aricrew with military aviation experience and ground-based participants in the Longitudinal Study of Astronaut Health (LSAH). The study of risk factors focuses on the types and doses of radiation exposure in space flight, on measures of terrestrial solar UV radiation exposure, measures of nutrition, smoking, and general health. The assessment of catract will use standardized digital images of the lens and validated measures of severity. The study will measure these measures of UV and ionizing radiation, nutrition, smoking, and general health. A secondary goal of this project will be to improve the routine annual clinical assessment of the ocular lens by including Nidek EAS 1000 digital imaging of the lens in the annual ocular examination protocol for astronauts. NASCA contains an initial cross-sectional assessment of the severity of the three types of lens opacification, and a follow-on assessment of progression rates of the three classes lens opacification in the populations of astronauts, military aircrew, and ground based comparison participants in the Longitudinal Study of Astronaut Health (LSAH). The main goal of the five-year longitudinal study is to determine the progression rates of the three main types of lens opacification in the LoSAH, and then determine the risk factors associated with cataract progression with a specific focus on the components and doses of radiation exposure during space flight. Specifically, total radiation lens dose, space radiation lens dose, space caterito, RosAN as approved and flunded this five-year, multi-centered research proposal entitled "The Precise Assessment of Prevalence and Progression of Lens Opacifies in Astronauts as a Function of Radiation Exposure During Space Flight." The Brigham and Women' Shoppial	
Rationale for HRP Directed Research:		
Research Impact/Earth Benefits:	Expanding our understanding of the mechanisms of space-radiation-induced cataract may suggest means of reducing the risk of radiation-induced cataract on earth among individuals employed in jobs in which radiation constitutes an occupational hazard. Also, it may suggest improved means of shielding the eyes of patients undergoing radiation therapy. Information about the mechanisms of cataracts in astronauts may suggest additional research into the causes of age-related cataract, the world's leading cause of blindness. Lastly, the longitudinal phase of the study which links nutritional data to the risk of cataract progression may suggest nutritional means of ameliorating the risk of cataract.	
	This Progress Report covers the period February 1, 2006 through January 31, 2007. Recruitment for NASCA began in July 2004. Our goal was to recruit all of the 285 US astronauts, 100 military aircrew members, and 100 ground-based controls. Most of our subjects were enrolled wihtin the first 18 months of active recruiting, a few were added in the subsequent six months. As of June 2006, we had enrolled 224 astronauts (78.6% of goal), 95 military aircrew (95% of goal), and 99 ground-based controls (99% of goal). The shortfall in enrolled astronauts was due largely to death, intervening cataract surgery (an exclusion criterion), and disinclincation to participate among older astronauts. The NASCA project is proceeding with these three cohorts. Over the summer of 2006 we completed the statistical analysis of the baseline data - the first year's data - and prepared two manuscripts: 1) describing the recruiting procedures and results, the methodologies used, the propensity scores for	

Bibliography Type:	Description: (Last Updated: 08/21/2012)
	As of February, 2007 the NASCA project is well into its third year, and when the last of the three-yearm evaluations is completed, we will be able to begin the first set of analyses of the longitudinal phase of the project in which we examine the relationship between the factors of interest to the rate of progression of lens opacification. This will be an important milestone in this project, since these measures are likely to be of greatest interest to NASA and the greater eye and radiation research communities.
	nutritional factors were associated N. Age was weakly associated with increased P. Conclusions: Exposure to space radiation increases risk of C opacification.
	Results: Age is the most important predictor of C. Older subjects had higher mean and more varied C. Astronauts who have not yet flown and aircrew controls had less C than controls, while astronauts who flew at least one mission in space had significantly greater C. Increased solar UV was associated with higher, and larger intake of A-vitamins with lower. C. Astronauts had less N. however neither space nor solar radiation exposure was associated with more N. No
	Methods: Objective measures of C, P, and N opacification were obtained from Nidek EAS 1000 digital lens images. Space radiation exposure was expressed as total lens dose/subject aggregated over missions. Solar ocular exposure and nutritional status were characterized. Statistical analyses consisted of fitting customized non-normal regression models to measures of opacity and testing effects of subject group, radiation exposure and other variables on degree of opacity.
	ABSTRACT: Objectives: NASCA is a five-year investigation in U.S. astronauts to determine the effect of space radiation exposure on severity and progression of cortical (C), nuclear (N), and posterior subcapsular (PSC) lens opacities.
	AFFILIATIONS: a. Center for Ophthalmic Research, Brigham and Women's Hospital, Boston, MA; b) NASA, Johnson Space Center; c) Baylor College of Medicine, Department of Medicine; d) Wyle Laboratories; e) Space Center Eye Associates; f) USRA Division of Space Life Sciences
	AUTHORS: Leo T. Chylack, Jr., M.D.(a), Alan H. Feiveson, Ph.D.(b), Leif Peterson, Ph.D.(c), F. Keith Manuel, O.D.(e), Mary L. Wear, Ph.D.(d), William H. Tung, B.S.(a), Dale Hardy, M.S.(c), Lisa Marak, R.N.(d), Cynthia Bell, M.S.(f), Francis Cucinotta, Ph.D.(b)
	TITLE: NASCA Report 2 – Cross-sectional Analyses of Space Radiation Exposure and Risk of Lens Opacity
	MANUSCRIPT 2:
	Conclusions: Confounder patterns based on military aviator controls were more similar to astronauts when compared with ground controls. This will be important for dose-response models employed during the cross-sectional and longitudinal analyses.
Task Progress:	Methods: Astronauts and exposure controls were recruited from the local occupational aerospace community. Severity of C, N, PSC lens opacification, age, demographics and general health, nutritional intake, solar ocular exposure, and other confounding variables were measured at baseline. Results: A total of 419 subjects were enrolled (223 astronauts, 96 military aviator controls, and 100 ground controls) who met inclusion criteria. Significant confounder variables were a history of asthma, history of hypertension, history of obesity, number of drug reported taking, and maximum high contrast LogMAR acuity. Propensity scores based on confounders suggest that military aviator controls were more similar to astronauts when compared with ground controls.
	Objectives: The NASA Study of Cataract in Astronauts (NASCA) is a five-year investigation of lens opacification in the U.S. astronauts and two exposure control groups with and without a history of military aviation, respectively. The goals are to determine the effect of space radiation exposure on the severity and progression of age-related cortical (C), nuclear (N), and posterior subcapsular (PSC) lens opacities.
	ABSTRACT:
	AFFILIATIONS: a) Center for Ophthalmic Research, Brigham and Women's Hospital, Boston, MA; b) Department of Medicine, Baylor College of Medicine, Houston, TX; c) Lyndon B. Johnson Space Center, NASA, Houston, TX; d) Wyle Laboratories, Houston, TX; e) Space Center Eye Associates, Houston, TX.
	AUTHORS: Leo T. Chylack, Jr.(a), M.D., Leif E. Peterson, Ph.D.(b), Alan H. Feiveson, Ph.D.(c), Mary Wear, Ph.D.(e), F. Keith Manuel, O.D.(e), William H. Tung (a), Dale Hardy, M.S.(b), Lisa Marak, R.N.(d), and Francis A. Cucinotta, Ph.D.(c)
	TITLE: NASCA Report 1: Study of Relationship of Exposure to Space Radiation and Risk of Lens Opacity
	MANUSCRIPT 1:
	A summary of the findings of the two manuscripts is provided below:
	In order to facilitate the abbreviation of these reports, we set up a second NASCA web site using a server that would hold all of the detailed materials about techniques, methods, policies, etc. and be accessible to the public. By removing all of the fine methodological detail from the two manuscripts and locating them on the publically accessible web site, we were able to meet the journal's requirements about manuscript length without limiting disclosure of the study's methods. The web site's URL is (<a "="").="" href="http://nasca-study.bwh.harvard.edu" target="blank">http://nasca-study.bwh.harvard.edu").
	each cohort, and the variables likely to confound the statistical analysis, and 2) describing the association between space radiation exposure, solar UV radiation exposure, nutrition, smoking, general health factors, and medications used to the severity of cortical (C), nuclear (N), and posterior subcapsular (P) lens opacification.

Abstracts for Journals and Proceedings	Chylack LT Jr, Feiveson AH, Peterson LE, Manuel FK, Wear ML, Hardy D, Marak L, Tung WH, Hernandez E, Cucinotta FA. "The NASA Study of Cataract in Astronauts (NASCA): Year-1 Data. " Annual Meeting of the Association for Research in Vision and Ophthalmology (ARVO), Ft. Lauderdale, FL, May 3, 2006. Invest Ophthalmol Vis Sci 2006 Apr;47: E-Abstract 4140. , Apr-2006
Abstracts for Journals and Proceedings	Chylack LT Jr, Feiveson AH, Peterson LE, Manuel FK, Wear ML, Tung WH, Hardy D, Marak L, Bell C, Cucinotta FA. "The NASCA study: cross-sectional analyses of exposure to radiation in space and risk of lens opacification." NASA Human Research Investigators' Workshop, League City, TX, February 12-13, 2007. NASA Human Research Investigators' Workshop, Feb 2007. , Feb-2007
Articles in Peer-reviewed Journals	Chylack LT Jr, Peterson LE, Feiveson AH, Wear ML, Manuel FK, Tung WH, Hardy D, Marak L, Cucinotta FA. "NASCA Report 1: Study of Relationship of Exposure to Space Radiation and Risk of Lens Opacity." Submitted to Archives of Ophthalmology, December, 2006 (Now under revision for resubmission). , Feb-2007
Articles in Peer-reviewed Journals	Chylack LT Jr, Feiveson AH, Peterson LE, Manuel FK, Wear ML, Tung WH, Hardy D, Marak L, Bell C, Cucinotta FA. "NASCA Report 2 – Cross-sectional Analyses of Space Radiation Exposure and Risk of Lens Opacity." Submitted to Archives of Ophthalmology, December 2006. (Now under revision for resubmission), Feb-2007
Awards	Chylack LT Jr. "Invited to present an overview of the NASCA project at a Clinical Conference at the National Eye Institute at the National Institutes of Health, September 13, 2006." Sep-2006