CRITICAL PATH ROADMAP DISCIPLINE(S)	PRIMARY SPECIES / TYPE	GROUND EXPERIMENT TITLE	NASA OBPR - TASK BOOK Year Experiment Was Listed in Book 1995 1996 1997 1998 1999 2000 2001 200									
Radiation Effects	Animal	Cancer Induction by Repeated Doses of High-LET Radiation; Cancer Risk Mechanisms Following Repeated Exposure to High LET Radiation	1995	1990	1997	1998	1999		2001			
Radiation Effects	Animal	Charged Particle Radiation-Induced Genetic Damage in Transgenic Mice							2001	20		
Radiation Effects:	Animal	Chemoprevention of Radiation-Induced Neoplasms;				1998	1999	2000	2001	20		
Clinical Capabilities	Zimmai	Chemoprevention of Radiation-Induced Rat Mammary Neoplasms				1776	1,,,,	2000	2001	120		
Radiation Effects;	Animal	Countermeasures for Space Radiation Biological Effects					<del></del>	$\vdash$	_	2		
Clinical Capabilities;	Allillai	Countermeasures for Space Radiation Biological Effects								1		
Food & Nutrition												
	A	Face di Barton Barron	1005	1006			<b>—</b>	-	-	┿		
Radiation Effects	Animal	Energetic Proton Dose-Response	1995	1996			1000	2000	2001	Η,		
Radiation Effects	Animal	Genomic Instability in High-LET Carcinogenesis					1999	2000	2001	2		
Radiation Effects	Animal	Germ-Cell Mutagenesis in Medaka Fish Following Exposure to Heavy, High Energy					1999	2000	2001	2		
		Cosmic Ray Nuclei (This Task began in FY2000)								1		
Radiation Effects	Animal	High Energy Ions and Genomic Instability;					1999	2000	2001	2		
		High-Energy Ions and Genomic Instability										
Radiation Effects	Animal	HZE Radiation Genotoxicity in Cultured Mammalian Cells		1996	1997	1998	1999					
Radiation Effects	Animal	In Vivo Induction and Repair of Genomic Instability					1999	2000				
Radiation Effects	Animal	Individual Susceptibility to Radiation Effects (This Task began in FY2000)					1999	2000	2001	2		
Radiation Effects	Animal	Interaction Between Tissue and Cellular Stress Response Following Charged Particle						2000	2001	T		
		Exposure										
Radiation Effects	Animal	Mechanisms of High-LET Induced Genomic Instability					1999	2000		T		
Radiation Effects	Animal	Modulation of Charged Particle Radiation Damage in the Nematode C. Elegans by Genes					1999			t		
radiation Effects	Zimmai	Regulating Oxidative Stress and Apoptosis					1,,,,					
Radiation Effects	A mimol	Molecular Analysis of HZE Damage in Transgenic Mice	1005	1006	1997	1000	1000	-	-	╁		
	Animal		1995	1996	1997	1998	1999	****	2004	Η.		
Radiation Effects	Animal	NSBRI Radiation Effects Core Project;				1998	1999	2000	2001	2		
		Radiation Effects: Core Project								L		
Radiation Effects;	Animal	Nutritional Countermeasures to Radiation Exposure							2001	1		
Clinical Capabilities;										П		
Food & Nutrition										L		
Radiation Effects	Animal	Proton Radiation Studies	1995	1996	1997	1998				Γ		
Radiation Effects	Animal	Quantitation of Radiation-Induced Deletion and Recombination Events Associated with				1998	1999	2000				
		Repeated DNA Sequences								П		
Radiation Effects	Animal	Radiation-Induced Cytogenetic Damage as a Predictor of Cancer Risk for Protons and Fe				1998	1999	2000		٢		
		Ions				2,70		_550		П		
Radiation Effects	Animal		1995	1996						t		
Radiation Effects;	Animal Animal	Radiobiological Studies - Task V (Final Year)	1995	1990			$\vdash$		2001	1		
	Animai	Redox Modulation of Muscle Function in Microgravity							2001	4		
Muscle Alterations & Atrophy										L		
Radiation Effects	Animal	Role of the Microenvironment in the Radiation Response of Epithelial Cells				1998	1999					
Radiation Effects;	Animal	Transcription Factor Evolution and Lymphocyte Origins (This Task began in FY2000)					1999	2000	2001	1		
Immunology, Infection & Hematology												
Radiation Effects	Animal	Transgenic Zebrafish as an Indicator of Mutagenic Risk					1999	2000				
Radiation Effects	Animal	Effects of Exposure to Heavy Particles	1995	1996	1997	1998	1999	2000				
Radiation Effects	Animal	Mechanisms of Genomic Instability from the Exposure of Mammalian Cells to High-LET			1997	1998				T		
		Radiations; Cooperative										
		Radiation Research (NCI) (Genomic Instability Investigations)										
Radiation Effects	Human	Cooperative Radiation Research (NCI)	1995	1996						t		
Radiation Effects	Human	DNA Repair and Early Development of Chromosomal Changes;	1773	1770			1999	2000	2001	1		
Radiation Effects	пишан						1999	2000	2001	1		
2. 1	**	DNA Repair and the Early Development of Chromosomal Changes					<u> </u>		L	Ļ.		
Radiation Effects	Human	Effect of Deep Space Radiation on Human Hematopoietic Stem Cells					L		2001	12		
Radiation Effects	Human	Factors Modulating Radiation-Induced G-2 Delays				1998	1999	2000	2001			
Radiation Effects	Human	Guidance on Radiation Received in Space Activities;			1997	1998	1999	N/A	2001	1		
		Guidance on Space Radiation Risks										
Radiation Effects	Human	High LET Mutagenesis and Genomic Instability;					1999	2000	2001	Г		
		High-LET Radiation and Genomic Instability in Human Cells										
Radiation Effects	Human	Human Enzymatic Repair of Radiation-Induced DNA Breaks	1995	1996	1997	1998	1999			T		
Radiation Effects	Human	HZE Radiation-Induced Chromosome Instability				-,,,	1999	2000	2001	Т		
Radiation Effects	Human	Induction of Chromosomal Aberrations in Human Cells by Charged Particles				1998	-,,,,	2000	2001	۲		
Radiation Effects	Human	Induction of Chromosomal Adertations in Human Cens by Charged Particles  Induction of Genomic Instability in Human Lymphoblasts				1770	1999	2000	2001	1		
			1005	1006	100=	1000				-		
Radiation Effects	Human	Lens Epithelium and Proton-Induced Cataractogenesis	1995	1996	1997	1998	1999	2000	2001	Ľ		
Radiation Effects	Human	Mechanisms of Radiation-Induced Genomic Instability					1999	2000	2001	Ļ		
Radiation Effects	Human	Molecular Damage of Human Cells by X-rays and Neutrons	1995	1996	1997	1998	1999			L		
Radiation Effects	Human	Mutagenesis and Chromosomal Alterations				1998	1999	2000		L		
Radiation Effects	Human	Mutagenesis in Human Cells With Accelerated H and Fe Ions				1998	1999	2000	2001	1		
Radiation Effects	Human	Mutations in Human Lymphoid Cells	1995	1996	1997					Ĺ		
Radiation Effects	Human	Neoplastic Cell Transformation With Protons and HZE	1995	1996	1997	1998				ſ		
Radiation Effects	Human	NSCORT in Radiation Health - Project 3A Mechanisms and Modulation of Mutagenesis							2001	1		
		in Human Cells										
Radiation Effects	Human	Operational Radiation Safety Program for Astronauts						2000		T		
Radiation Effects	Human	Population Dosimetry for Russian Plutonium Workers;			1997	1998	1999			٢		
The state of the s		Dosimetry for Populations Residing Near Techa River			.,,,	.,,,,	.,,,					
Radiation Effects;	Human	Radiation Anticarcinogenesis by Thiazolidine Prodrugs		1996	1997	1998				H		
	Tuman	Andreas Anticaremogenesis by Tillazondilic Flourings		1990	1991	1770				П		
Clinical Capabilities	Hames :	Disk Assessment and Champing of the CHIZE I. Land CHIZE D					$\vdash$		2001	H		
Radiation Effects	Human	Risk Assessment and Chemoprevention of HZE-Induced CNS Damage			100-	100-	100	2000	2001	Į.		
Radiation Effects	Human	Risk Management Strategies During Solar Events;			1997	1998	1999	2000	2001			
		NAG5-3888 Risk Management Strategies During Solar Particle Events on a Human								П		
		Mission to Mars or the Moon; Risk								П		
		Management Strategies for Solar Particle Events								L		
Radiation Effects	Human	Roles of Human Recombination Genes in Genome Instability;					1999	2000	2001			
		Roles of Human Recombination in Genome Instability								П		
Radiation Effects	Human	Telomere Repair and Chromosome Instability After High LET Particle Irradiation						2000	2001	٢		
Radiation Effects	Human	The Effect of Single Particle Traversals on a Mechanism of Cell-Cycle Regulation	1995	1996	1997	1998	1999	2000	2001	٢		
manutivii Liivelä	Human	Training and Basic Research to Health Effects of Exposure to HZE Particles in Extended	1773	1770	1///	1770	1777		2001	1		
	Tuman								2001	ľ		
	0.1	Missions	100-	100	100-	100-	100			Ļ		
Radiation Effects		3D ORAM Dosimeter for Space Radiation Environments	1995	1996	1997	1998	1999			Ļ		
Radiation Effects Radiation Effects	Other	14.1 177.1 1 D 1 4 D:						2000	2001	1		
Radiation Effects Radiation Effects	Other	Advanced Technology Development - Biosensors										
Radiation Effects  Radiation Effects  Radiation Effects;  Clinical Capabilities;		Advanced Technology Development - Biosensors								L		
Radiation Effects Radiation Effects Radiation Effects;		Advanced Technology Development - Biosensors										
Radiation Effects Radiation Effects Radiation Effects; Clinical Capabilities; Environmental Health	Other				1997	1998	1999	2000	2001			
Radiation Effects Radiation Effects Radiation Effects; Clinical Capabilities; Environmental Health Radiation Effects	Other Other	AGS Beam Time (HZE Particles)			1997	1998	1999	2000	2001	1		
Radiation Effects Radiation Effects Radiation Effects; Clinical Capabilities; Environmental Health	Other				1997 1997	1998 1998	1999 1999	2000	2001			

CRITICAL PATH ROADMAP DISCIPLINE(S)	PRIMARY	RY			NASA OBPR - TASK BOOK								
	SPECIES /	GROUND EXPERIMENT TITLE	Year Experiment Was Listed in Book										
	TYPE		1995	1996		<u>1998</u>	1999	2000	2001	2002			
Radiation Effects	Other	Experimental Study of Nuclear Interactions Relevant to High Energy Heavy Ion Transport	1995	1996	1997	1998	1999						
Radiation Effects	Other	Heavy Ion Microbeam and Micron Resolution Detector							2001	2002			
Radiation Effects;	Other	High-resolution Digital Mammography/NCI	1995	1996	1997	1998							
Clinical Capabilities													
Radiation Effects	Other	HZE and Proton Induced Microenvironments						2000					
Radiation Effects	Other	HZE and Proton-Induced Microenvironment Remodeling		1996	1997	1998							
Radiation Effects	Other	In Situ Spectrometry of Neutrons;				1998	1999	2000					
		In-Situ Spectrometry of Neutrons											
Radiation Effects	Other	Microdosimetric Studies					1999	2000	2001	2002			
Radiation Effects;	Other	Miniature Time of Flight Mass Spectrometer				1998	1999	2000					
Human Behavior & Performance;													
Clinical Capabilities;													
Environmental Health													
Radiation Effects	Other	Neutron Energy Spectrometer							2001	2002			
Radiation Effects	Other	NSCORT (Radiation Health): Theoretical Modeling Of DNA Damage and Cellular								2002			
		Responses											
Radiation Effects	Other	NSCORT: Radiation Health	1995	1996	1997	1998							
Radiation Effects	Other	Radiation and Environmental Health	1995	1996									
Radiation Effects	Other	Radiation Risk Analysis: Model Issues and Interspecies Extrapolation					1999	2000	2001	2002			
Radiation Effects;	Other	Real-Time Analysis of Biomarkers and Countermeasures Using a Miniature Time of							2001	2002			
Clinical Capabilities		Flight Mass Spectrometer											
Radiation Effects	Other	Space Radiation Transport and Interaction	1995	1996	1997	1998							
Radiation Effects	Other	Systems Studies at New Jersey - NASA Specialized Center of Research and Training (NJ-				1998	1999	2000	2001				
		NSCORT); Systems											
		Studies at NJ-NSCORT											
Radiation Effects;	Other	Towards Intelligent Distributed Bioluminescence Detection of Biological Contamination					1999	2000	2001	2002			
Environmental Health		and Stressors											