CRITICAL PATH ROADMAP DISCIPLINE(S)	PRIMARY SPECIES / TYPE	SPECIES / GROUND EXPERIMENT TITLE	NASA OBPR - TASK BOOK Year Experiment Was Listed in Book  1995 1996 1997 1998 1999 2000 2001 2002								
Clinical Capabilities;	Air	Advanced Technology Development - Biosensors			1001	1000	1000	2000	2001	2002	
Radiation Effects;											
Environmental Health Clinical Capabilities;	Air	Electronic Nose				1998	1999				
Environmental Health;	All	Electronic Nose				1996	1999				
Advanced Life Support											
Clinical Capabilities;	Air	Electronic Nose Re-Flight						2000			
Environmental Health;											
Advanced Life Support Clinical Capabilities;	Animal	Chemoprevention of Radiation-Induced Neoplasms;				1998	1999	2000	2001	2002	
Radiation Effects	Animai	Chemoprevention of Radiation-Induced Neoplasms, Chemoprevention of Radiation-Induced Rat Mammary Neoplasms				1996	1999	2000	2001	2002	
Clinical Capabilities;	Animal	Countermeasures for Space Radiation Biological Effects								2002	
Radiation Effects;		·									
Food & Nutrition											
Clinical Capabilities;	Animal	Effects of Circadian Rhythms on Decompression Outcome				1998	1999	2000	2001		
Human Behavior & Performance Clinical Capabilities	Animal	Fully Implantable Integrated Silicon Biotelemetry	1995	1996	1997	1998	1999				
Clinical Capabilities;	Animal	GH/IGF-I Transgene Expression on Muscle Homeostasis	1993	1990	1997	1998	1999	2000			
Muscle Alterations & Atrophy		, , , , , , , , , , , , , , , , , , ,									
Clinical Capabilities;	Animal	Healing Response of Injured Rodent Knee Ligaments to Hindlimb Unweighting and the					1999	2000	2001	2002	
Bone Loss;		Therapeutic Efficacy of Growth Hormone (This Task began in FY2000)									
Immunology, Infection & Hematology;											
Muscle Alterations & Atrophy Clinical Capabilities;	Animal	Nutritional Countermeasures to Radiation Exposure							2001	2002	
Radiation Effects;	Aiiiiiai	Exposure Exposure							2001	2002	
Food & Nutrition											
Clinical Capabilities;	Animal	Pharmacological Intervention to Prevent Disuse Osteopenia		1996	1997	1998	N/A	N/A	2001	2002	
Bone Loss	A	The PCC at CMC and the Part of							2001	2002	
Clinical Capabilities; Bone Loss	Animal	The Effect of Microgravity on Fracture Healing/Ultrasound as a Possible Countermeasure							2001	2002	
Bone Loss Clinical Capabilities;	Animal	Vascular Genomics in Gravitational Transitions							2001		
Cardiovascular Alterations	. tiiiiiai	Senomics in Gravitational Hambitions							2001		
Clinical Capabilities;	Animal	Role of Vitamin E in Preventing Oxidative Damage to Bone in Near Weightlessness;					1999	2000	2001		
Bone Loss;		The Role of Vitamin E in Preventing Oxidative Damage to Bone in Near Weightlessness									
Food & Nutrition		and its Effects on Bone Quality During Recovery (This Task began in FY2000)									
ar: 10 122	**	A T C DI CL II D 141 IV C C C							****		
Clinical Capabilities	Human	An Innovative Physiologically Based Advanced Liquid Cooling/Warming Garment for Routine and Emergency EVA						2000	2001	2002	
Clinical Capabilities	Human	Biomedical Investigations with Laser-Polarized Noble Gas Magnetic Resonance (This					1999	2000	2001	2002	
Ciliical Capatifics	Tuman	Task began in FY2000)					1///	2000	2001	2002	
Clinical Capabilities	Human	Biophysical, Mathematical Models of Gas Phase Formation	1995	1996	1997						
Clinical Capabilities	Human	Carbon Dioxide-Oxygen Interactions in Extension of Tolerance to Acute Hypoxia	1995	1996	1997	1998	1999				
Clinical Capabilities;	Human	Characterization of Autonomic Function, Sodium Handling, and Nitric Oxide Physiology					1999	2000	2001	2002	
Cardiovascular Alterations		in Astronauts and Patients Known to be Susceptible to Orthostatic Intolerance (This Task									
Clinical Capabilities;	Human	began in FY2000)  Clinical Trial of the Efficacy of Melatonin as a Countermeasure for Entrainment to the				1998	1999	2000	2001		
Human Behavior & Performance	Tumum	Sleep/Wake Schedules Required During Shuttle Missions				1770	1,,,,	2000	2001		
Clinical Capabilities;	Human	Correlation Between Physiology and Shuttle Emergency Egress (1 year proposal)	1995								
Cardiovascular Alterations;											
Muscle Alterations & Atrophy	**					4000	4000				
Clinical Capabilities; Human Behavior & Performance	Human	Countermeasures to Neurobehavioral Deficits from Cumulative Partial Sleep Deprivation				1998	1999	2000			
Clinical Capabilities;	Human	During Space Flight  Design and Validation of a Dynamic Exercise Countermeasure Device							2001	2002	
Cardiovascular Alterations;	11411411	beign and variation of a bynamic Exercise countermeasure before							2001	2002	
Muscle Alterations & Atrophy											
Clinical Capabilities;	Human	Designing a Smart Medical System for Psychosocial Support							2001	2002	
Human Behavior & Performance	**								****		
Clinical Capabilities; Cardiovascular Alterations	Human	Diagnostic Three Dimensional Ultrasonography: Development of Novel Compression,							2001	2002	
Cardiovasculai Alterations		Segmentation and Registration Techniques for Manned Space Flight Applications									
Clinical Capabilities;	Human	Digital Echocardiography in Manned Space Flight: Remote Diagnosis and Quantitative			1997	1998	1999	2000			
Cardiovascular Alterations		Analysis									
Clinical Capabilities;	Human	Echocardiographic Assessment of Cardiovascular Adaptation and Countermeasures in							2001	2002	
Cardiovascular Alterations	Uume-	Microgravity  Effect of Ped Peet on Simulated Shuttle Emergency Egrees		1006	1007						
Clinical Capabilities Clinical Capabilities	Human Human	Effect of Bed Rest on Simulated Shuttle Emergency Egress  Emergency Medical Procedures on ISS: An Independent Human Factors Analysis and		1996	1997					2002	
		Review								2002	
Clinical Capabilities;	Human	Facilitated Blood Pressure Control by Skin Cooling: Autonomic Mechanisms	1995	1996	1997	1998	1999	2000			
Cardiovascular Alterations											
Clinical Capabilities	Human	Factors Affecting Decompression Sickness in Astronauts During Extravehicular Activity	1995	1996	1997	1998	1999				
Clinical Canabilities	Hame :	FoodCommand Action Mains Deduction Harden Co. C.					1000	2000	2001	2002	
Clinical Capabilities	Human	Feedforward Active Noise Reduction Headphones for Otoacoustic Hearing Assessment of Space Station Crews (This Task began in FY2000)					1999	2000	2001	2002	
Clinical Capabilities;	Human	Heart Rate Dynamics During Microgravity Exposure: Data Analysis	1995	1996	1997	1998	1999				
Cardiovascular Alterations;		, , , , , , , , , , , , , , , , , , , ,									
Neurovestibular Adaptation											
Clinical Capabilities;	Human	Impact of Microgravity on Drug and Nutrient Absorption (This Task began in FY2000)					1999	2000	2001	2002	
Food & Nutrition	11	Industrial College Col				1000	1000	2000			
Clinical Capabilities;	Human	Instrumentation for Non-Invasive Assessment of Cardiovascular Regulation				1998	1999	2000			
Cardiovascular Alterations Clinical Capabilities;	Human	Intestinal Adaptation in Microgravity Drug and Nutrient Adsorption		1996	1997	1998					
Food & Nutrition	- uniun	Transferred in Price oglavity Diag and Paulicit Ausorption		1770	1)))	1/70					
Clinical Capabilities	Human	Investigation Of Laser-Polarized Xenon Magnetic Resonance		1996	1997	1998	1999				
Clinical Capabilities;	Human	Measurement of Body Composition For Nutrition Assessment in Microgravity				1998	1999	2000			
Food & Nutrition;											
Muscle Alterations & Atrophy	Uume-	Mochanisms of Antiorrhythmia Dava Astica	1007	1006	1005	1000					
Clinical Capabilities; Cardiovascular Alterations	Human	Mechanisms of Antiarrhythmic Drug Action	1995	1996	1997	1998					
Clinical Capabilities	Human	Microcapsule Gel Formulation of Promethazine Hydrochloride for Intranasal							2001	2002	
сы сириоличес		Administration							2001	2002	
Clinical Capabilities;	Human	Microgravity Investigation and Crew Reactions in 0-G (MICR0-G)				1998	1999	2000	2001	2002	

CRITICAL PATH ROADMAP DISCIPLINE(S)	PRIMARY	PRIMARY	NASA OBPR - TASK BOOK									
	SPECIES /	GROUND EXPERIMENT TITLE						sted in Book		4 0000		
	TYPE	Mir a British British	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	2000	<u>2001</u>	2002		
Clinical Capabilities Clinical Capabilities	Human Human	Multipurpose Crew Restraints for Long Duration Space Flights  Near Infrared Brain Imaging for Space Medicine							2001	2002		
Clinical Capabilities  Clinical Capabilities	Human	Neuronal Vulnerability and Informatics in Human Disease;	1995	1996	1997	1998			2001	2002		
Cimical Capacinates	Tumum	Neuronal Vulnerability and Informatics in Human Disease [Human Brain Project]	1773	1770	1,,,,	1770						
Clinical Capabilities;	Human	Non-Invasive Assessment of Susceptibility to Ventricular Arrythmias During Simulated				1998	1999	2000				
Cardiovascular Alterations		Microgravity										
Clinical Capabilities;	Human	Noninvasive Measurement of Blood and Tissue Chemistry							2001	2002		
Cardiovascular Alterations												
Clinical Capabilities;	Human	Noninvasive Monitoring of Bone Resorption and Sweat Calcium Using Skin Patches					1999	2000	2001			
Bone Loss												
Clinical Capabilities;	Human	Nutritional Interventions to Improve Muscle Protein Metabolism During Stress (This Task					1999	2000	2001	2002		
Food & Nutrition;		began in FY2000)										
Muscle Alterations & Atrophy	**							****		****		
Clinical Capabilities	Human	Optical Biosensors for In-Flight Measurement of Hormone Levels						2000	2001	2002		
Clinical Capabilities;	Human	Pharmacological Countermeasures for Space Motion Sickness							2001	2002		
Neurovestibular Adaptation Clinical Capabilities	Human	Dhysiological Effects of a Machanical Counter Droscoura Suit				1		2000	2001	2002		
Clinical Capabilities;	Human Human	Physiological Effects of a Mechanical Counter Pressure Suit  Prevention of Bed Rest Osteoporosis: Resistive Exercise			1997	1998	1999	2000	2001	2002		
Bone Loss;	Tuman	Trevention of Bed Rest Osteopolosis. Resistive Exercise			1997	1990	1999	2000	2001	2002		
Muscle Alterations & Atrophy												
Clinical Capabilities;	Human	Radiation Anticarcinogenesis by Thiazolidine Prodrugs		1996	1997	1998						
Radiation Effects				1770	2777	1770						
Clinical Capabilities	Human	Smart Medical System for Detection of Microorganisms;							2001	2002		
•		Smart Medical System for the Detection of Microorganisms										
Clinical Capabilities	Human	Spatially Oriented Database for Digital Brain Images;	1995	1996	1997	1998	1999					
		Spatially Oriented Database for Digital Brain Images [Human Brain Project]										
Clinical Capabilities;	Human	The Development and Human Factors Analysis of Advanced 3D-Visualization for						2000	2001	2002		
Human Behavior & Performance		Telepresence										
Clinical Capabilities;	Human	The Effects of Exercise-Enhanced Denitrogenation on Altitude Decompression Sickness	1995	1996	1997	1998	1999					
Cardiovascular Alterations		(DCS) Protection										
Clinical Capabilities	Human	Visual Anatomic Guidance to Facilitate Ultrasound Image Acquisition						2000	2001			
Clinical Capabilities;	Human	Vitamin D RDA from Supplement of Light		1996	1997	1998	1999					
Bone Loss	**	DI 11 1 IECC + CD 1 1 IV DIII	1005	1007	1005	1000	1000					
Clinical Capabilities;	Human	Physiological Effects of Decompression-Induced Venous Bubbles	1995	1996	1997	1998	1999					
Cardiovascular Alterations Clinical Capabilities;	Other	Compact, High Precision, Multiple Projection DEXA Scanner				1998	1999	2000				
Bone Loss;	Other	Compact, Figh Frecision, Muniple Projection DEXA Scanner				1998	1999	2000				
Muscle Alterations & Atrophy												
Clinical Capabilities	Other	Development of Analytical Tools to Process and Apply Digitally Scanned Anthropometric								2002		
Cimical Capacinities	Other	Data								2002		
Clinical Capabilities;	Other	Dual-Energy System for Precision Bone Mineral Densitometry and Diagnostic					1999	2000	2001	2002		
Bone Loss		Radiography;										
		Dual-Energy X-Ray System for Bone Mineral Densitometry and Diagnostic Radiography;										
		Dual-Energy X-ray System for Precision Bone Mineral Densitometry and Diagnostic										
		Radiography (This Task began in FY2000)										
Clinical Capabilities;	Other	Environmental Biomedical Research Data Center;	1995	1996	1997	1998	1999					
Environmental Health;		Environmental Biomedical Stress Data Center										
Advanced Life Support												
Clinical Capabilities	Other	Guided High Intensity Focused Ultrasound for Mission-Critical Care							2001	2002		
Clinical Capabilities;	Other	High-resolution Digital Mammography/NCI	1995	1996	1997	1998						
Radiation Effects	Othor	Humann aloning d 120Va MDI of the Dusin, Lawrence d Disease				1000	1000	2000	2001	2002		
Clinical Capabilities;	Other	Hyperpolarized 129Xe MRI of the Brain, Lungs and Plants				1998	1999	2000	2001	2002		
Cardiovascular Alterations Clinical Capabilities;	Other	Improved Bubble Detection for EVA							2001	2002		
Environmental Health	Other	Improved Bubble Detection for EVA							2001	2002		
Clinical Capabilities;	Other	Miniature Time of Flight Mass Spectrometer				1998	1999	2000				
Radiation Effects;	Other	iviniature Time of Fright Wass Spectrometer				1776	1)))	2000				
Human Behavior & Performance;												
Environmental Health												
Clinical Capabilities;	Other	Multianalyte Biosensor with Chips for Human and Environmental Monitoring						2000				
Environmental Health												
Clinical Capabilities;	Other	Multianalyte Biosensor with Chips for Human and Environmental Monitoring						2000	2001	2002		
Environmental Health;		, , , , , , , , , , , , , , , , , , , ,										
Advanced Life Support												
Clinical Capabilities;	Other	Non-Invasive Monitoring of Physiological Analytes						2000	2001			
Bone Loss												
Clinical Capabilities;	Other	Non-Invasive Monitoring Through Transdermal Sweat Detection					1999					
Bone Loss												
Clinical Capabilities;	Other	Real-Time Analysis of Biomarkers and Countermeasures Using a Miniature Time of							2001	2002		
Radiation Effects		Flight Mass Spectrometer										
Clinical Capabilities	Other	Space Qualifiable Magnetic Resonance Imaging System							2001	2002		