|                                                           | PRIMARY           |                                                                                                |                                                             | NASA OBPR - TASK BOOK |              |              |             |      |      |      |  |  |
|-----------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------|--------------|--------------|-------------|------|------|------|--|--|
| CRITICAL PATH ROADMAP                                     | SPECIES /<br>TYPE | SPACE FLIGHT EXPERIMENT TITLE                                                                  | NASA OBPR - TASK BOOK<br>Year Experiment Was Listed in Book |                       |              |              |             |      |      |      |  |  |
| DISCIPLINE                                                |                   |                                                                                                | <u>1995</u>                                                 | <u>1996</u>           | 1997         | <u>1998</u>  | <u>1999</u> | 2000 | 2001 | 2002 |  |  |
| Cardiovascular Alterations                                | Animal            | Arterial Remodeling and Functional Adaptations Induced by Microgravity                         |                                                             |                       |              |              | 1999        | 2000 | 2001 | 2002 |  |  |
| Cardiovascular Alterations;                               | Animal            | Avian Blood Formation in Space                                                                 | 1995                                                        | 1996                  | 1997         | 1998         | 1999        |      |      |      |  |  |
| Immunology, Infection & Hematology                        |                   |                                                                                                | 100.                                                        |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Animal            | Biochemical Assessment of Stress in Cardiac Tissue                                             | 1995                                                        | 1007                  | 1005         | 1000         |             |      |      |      |  |  |
| Cardiovascular Alterations;<br>Food & Nutrition           | Animal            | Ca2+ Metabolism and Vascular Function After Space Flight                                       | 1995                                                        | 1996                  | 1997         | 1998         |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Animal            | Effects of Circadian Rhythms on Decompression Outcome                                          |                                                             |                       |              |              |             |      |      | 2002 |  |  |
| Clinical Capabilities;                                    | Ammai             | Encers of Circadian Rifymins on Decompression Outcome                                          |                                                             |                       |              |              |             |      |      | 2002 |  |  |
| Human Behavior & Performance                              |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Animal            | Expression of Contractile Proteins in Microgravity                                             | 1995                                                        | 1996                  | 1997         | 1998         | 1999        |      |      |      |  |  |
| Muscle Alterations & Atrophy                              |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Animal            | Mitochondrial Changes in Muscle Following Space Flight (Martin)                                | 1995                                                        |                       |              |              |             |      |      |      |  |  |
| Muscle Alterations & Atrophy                              |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Animal            | Soluble Guanylyl Cyclase Knock-out Model                                                       |                                                             |                       |              |              |             |      |      | 2002 |  |  |
| Clinical Capabilities                                     |                   |                                                                                                |                                                             |                       |              |              |             |      |      | -    |  |  |
| Cardiovascular Alterations                                | Human             | Adaptive Changes in Cardiovascular Control at µG                                               | 1995                                                        | 1996                  | 1997         | 1998         | 1999        |      |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Assessment of Autonomic and Gastric Function During Spaceflight, Entry and Landing             | 1995                                                        | 1996                  |              |              |             |      |      |      |  |  |
| Clinical Capabilities                                     | TT                | Antonenia Mashariana Davia Darlana di Waishdaanaa                                              | 1007                                                        | 1007                  | 1007         | 1000         |             |      |      |      |  |  |
| Cardiovascular Alterations<br>Cardiovascular Alterations; | Human<br>Human    | Autonomic Mechanisms During Prolonged Weightlessness Autonomic Neurophysiology in Microgravity | 1995<br>1995                                                | 1996<br>1996          | 1997<br>1997 | 1998<br>1998 | 1999        | 2000 | 2001 | 2002 |  |  |
| Neurovestibular Adaptation;                               | ruman             | Autonomic rearophysiology in wherogravity                                                      | 1995                                                        | 1990                  | 1997         | 1998         | 1999        | 2000 | 2001 | 2002 |  |  |
| Multi-system (Cross Risk) Alterations                     |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Autonomic Neuroplasticity in Weightlessness                                                    | 1995                                                        | 1996                  | 1997         | 1998         | 1999        | 2000 |      |      |  |  |
| Multi-system (Cross Risk) Alterations                     |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Cardiac Atrophy and Diastolic Dysfunction During and After Long Duration Spaceflight:          |                                                             |                       |              |              |             | 2000 | 2001 | 2002 |  |  |
|                                                           |                   | Functional Consequences for Orthostatic Intolerance and Risk of Cardiac Arrhythmias            |                                                             |                       |              |              |             |      |      |      |  |  |
|                                                           |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Cardiac Atrophy and Diastolic Dysfunction During and After Long Duration Spaceflight:          |                                                             |                       |              |              |             |      | 2001 | 2002 |  |  |
|                                                           |                   | Functional Consequences for Orthostatic Intolerance, Exercise Capacity, and Risk of            |                                                             |                       |              |              |             |      |      |      |  |  |
|                                                           |                   | Cardiac Arrhythmias                                                                            |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Entry Monitoring                                                                               |                                                             |                       |              |              |             |      |      | 2002 |  |  |
| Cardiovascular Alterations;                               | Human             | Evaluation of Thermoregulation During Long Duration Spaceflight                                | 1995                                                        | 1996                  | 1997         | 1998         | 1999        |      |      |      |  |  |
| Clinical Capabilities<br>Cardiovascular Alterations;      | Human             | Evaluation of Thermoregulation During Short-Duration Space Flight                              |                                                             | 1996                  | 1997         | 1998         | 1999        |      |      |      |  |  |
| Clinical Capabilities                                     | Human             | Evaluation of Thermoregulation During Short-Duration Space Flight                              |                                                             | 1990                  | 1997         | 1998         | 1999        |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Extended Studies of Pulmonary Function in Weightlessness                                       | 1995                                                        | 1996                  | 1997         | 1998         |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Fluid and Electrolyte Homostasis and its Regulation                                            | 1995                                                        | 1996                  | 1))/         | 1770         |             |      |      |      |  |  |
| Clinical Capabilities;                                    |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Food & Nutrition                                          |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Human Cardiovascular Performance in the Space Flight Environment                               |                                                             |                       |              |              |             | 2000 |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Individual Susceptibility to Postflight Orthostatic Hypotension;                               |                                                             |                       | 1997         | 1998         | 1999        | 2000 | 2001 | 2002 |  |  |
| Clinical Capabilities                                     |                   | Individual Susceptibility to Post-Spaceflight Orthostatic Intolerance: Contributions of        |                                                             |                       |              |              |             |      |      |      |  |  |
|                                                           |                   | Gender-Related and Microgravity-Related Factors                                                |                                                             |                       |              |              |             |      |      | -    |  |  |
| Cardiovascular Alterations                                | Human             | Integration of Neural Cardiovascular Control in Space                                          | 1995                                                        | 1996                  | 1997         | 1998         | 1999        | 2000 |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Maximal Aerobic Capacity Using Graded Bicycle Ergometry                                        | 1995                                                        | 1996                  |              |              |             |      |      |      |  |  |
| Clinical Capabilities<br>Cardiovascular Alterations;      | Human             | Physiological Response During Descent on the Space Shuttle                                     | 1995                                                        | 1996                  |              |              |             |      |      |      |  |  |
| Clinical Capabilities                                     | Tuman             | i nysiological response buring beseen on the space shuttle                                     | 1)93                                                        | 1750                  |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Pulmonary Function During Extended Exposure to Weightlessness                                  | 1995                                                        |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Pulmonary Function During Extended Exposure to Weightlessness (Euromir 95)                     | 1995                                                        | 1996                  |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Red Blood Cell Mass and Survival                                                               | 1995                                                        | 1996                  |              |              |             |      |      |      |  |  |
| Immunology, Infection & Hematology                        |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Sleep and Respiration in Microgravity                                                          | 1995                                                        | 1996                  | 1997         | 1998         | 1999        | 2000 |      |      |  |  |
| Human Behavior & Performance                              |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Studies of Mechanisms Underlying Orthostatic Intolerance Using Ambulatory Monitoring,          | 1995                                                        | 1996                  |              |              |             |      |      |      |  |  |
|                                                           |                   | Baroflex Testing and the Valsalva Maneuver                                                     |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations                                | Human             | Studies on Orthostatic Tolerance with the Use of LBNP                                          | 1995                                                        | 1996                  |              |              |             |      |      | 2002 |  |  |
| Cardiovascular Alterations;                               | Human             | Test of Midodrine as Countermeasure against Postflight Orthostatic Hypotension                 |                                                             |                       |              |              |             |      |      | 2002 |  |  |
| Clinical Capabilities<br>Cardiovascular Alterations       | Human             | The Effects of EVA and Long-Term Exposure to Microgravity on Pulmonary Function                |                                                             |                       |              | 1998         | 1999        | 2000 | 2001 | 2002 |  |  |
| Cardiovascular Anerations                                 | Tuman             | The Effects of E v A and Long-Term Exposure to Microgravity on Funnonary Function              |                                                             |                       |              | 1998         | 1999        | 2000 | 2001 | 2002 |  |  |
| Cardiovascular Alterations;                               | Human             | The Role of Intracranial Pressure in Space Adaptation Syndrome                                 |                                                             |                       |              |              | 1999        | 2000 | 2001 | 2002 |  |  |
| Clinical Capabilities                                     |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |
| Cardiovascular Alterations;                               | Human             | Validation of Centrifugation as a Countermeasure for Otolith Deconditioning During             |                                                             |                       |              |              |             | 2000 | 2001 | 2002 |  |  |
| Clinical Capabilities;                                    |                   | Space Flight                                                                                   |                                                             |                       |              |              |             |      |      |      |  |  |
| Neurovestibular Adaptation                                |                   |                                                                                                |                                                             |                       |              |              |             |      |      |      |  |  |