

## The International Space Medicine Summit (ISMS-2011) Group C Team Findings and Recommendations

### Group C Team:

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### Team Assignment:

*Educational and Research Needs, Strategies and Opportunities for Bridging the Sciences and Ensuring Safe Space Exploration.*

The international team members with backgrounds in physiology, space physiology and human adaptation, education, international education and outreach programs, space flight, bone physiology, radiation biology, project management, space biomedical research management, government research management, biomechanics, human health research in space, astrophysics, medical disciplines, nanotechnology, life support systems, circadian physiology, and others, worked to summarize findings and generate recommendations as follows:

### General Findings:

The success of human space flight programs attests to the effectiveness of integrated multidisciplinary approach to solving extremely complex challenges. The human space exploration programs are and will be a major resource for continued advancement of the human society through education, research, and application of space-derived knowledge and technology.

These broad challenges should be addressed through international collaboration and standardization, cultural and national adaptability and scalability, and will require policy decisions and resources for national and international implementation.

Future space flight will be international in scope and will constitute a blend of government and commercial activities.

Space medicine and life science results have tangible impacts on Earth based medicine. This area offers numerous examples of terrestrial benefits of human space exploration.

Educational outreach is an essential strategic part of national and international space programs. There needs to be greater interdisciplinary education and research availability at all levels of education and research, particularly for teachers working with younger children.

### Public Awareness of Space Science:

#### Findings:

Public awareness of the current space exploration efforts and the promise of future programs varies among countries and regions.

#### Suggested Approaches:

Sustained public awareness of space exploration results and future benefits should be considered by international bodies, governments, and private enterprises as a strategic goal to ensure broad public and political support of space programs and space life sciences research.

Sufficient resources should be available to disseminate both results and promise of space programs to all strata of public with emphasis on school and university leaders, teachers, and mentors.

## **Education**

### Findings:

Introduction of information derived from space sciences in early phases of education has a strong potential to stimulate interest, leading to long-lasting involvement and lifelong careers in cutting edge areas of biomedical sciences and technology.

### Suggested Approaches:

Education should be recommended as a strategic goal of government space programs and should be encouraged among private companies engaged in space flight and space exploration. Teacher education is an important component of this strategy.

International collaboration should be pursued through forums and other opportunities among educators in space sciences, using the experience and spirit of the International Space Station and other programs. These efforts could be championed by the space agencies using existing organizational mechanisms and international bodies such as COSPAR and organizations under the auspices of the United Nations.

## **Advanced Professional Education**

### Findings:

Advanced professional education in space science disciplines is a strategically important area to sustain the momentum of space exploration and maximize its terrestrial benefits. Postgraduate education opportunities are a primary pathway to career choices in space sciences research and teaching.

### Suggested Approaches:

More efforts should be focused on supporting broader involvement of scientists in space science research through postgraduate school curricula as well as individual degree topics and areas.

Commercial companies should be encouraged to participate in education. Business students should receive special attention in the area of commercial space flight and space exploration.

## **Ensuring Safe Space Exploration**

### Findings:

Current and future space science should pursue advancements in medical standards and operational requirements for future space operations, rescue mechanisms and capabilities, space traffic control, orbital debris, and many others. Some particular life science research will have to take place in areas of biomedical support and advances life support systems.

### Suggested Approaches:

The introduction of future space exploration, including commercial space flights, requires considerable development and should be addressed at the next summit.