

The following pages summarize the major challenges that were identified in each of the sessions in the workshop focused on:

Air and Space Transportation
Earth System Sciences
Life Sciences and Biology

Some of these challenges may provide inspiration for innovative and revolutionary advanced concept proposals to the NIAC.

- Aeronautics/astronautics synergism and cross fertilization
- Integrated, spaced based, global air traffic management system
- Ultra-duration stratospheric flight platforms
- Automated, human centered, fault tolerant, intelligent control architectures
- Virtual aircraft design architecture
- Expand use of multiple, robotics systems & distributed sensors
- Floating cities on Venus
- Propellantless systems
- Maglev accelerator variations
- Multi-mode propulsion/power systems

- **Common issues**

 - Sampling

 - Data quality

 - Knowledge dissemination

- **Common requirements**

 - Advances in cluster & constellation management

 - virtual sensors, virtual platforms

 - dynamic, cooperating communities of sensor platforms

 - automated and resilient platform management

 - Shift to commodity pricing model

 - Data continuity

 - Observing systems - satellites and insitu

 - Improvements in SNR

 - e.g., bioengineering of potential targets

 - Data Dissemination

- Metabolism sensors
- Symbiotic robotic/human task management
- Radiation shielding, mitigation, risk assessment
- Plants on long term missions, energetics
- Engineered plants
- Autonomous, self-replicating systems
- Merge physical/biological architectures
- Merge information technology and genomics
- Non-biological food production
- Gene therapy for space-caused disorders
- Subterranean structures for living and experiments
 - Light acquisition for plant growth
 - Low light plants
 - Transgenetic methods, biodiversity
 - Human/robotic synthesis
 - Selecting crews rather than individuals
 - Space suits, flexible, non-hindering
 - Selecting crews rather than individuals
 - Sex, psychological & reproductive issues
 - Integrated propulsion/transportation systems and life support
 - Hibernation
 - Novel methods for detecting life