Visions of the Future in Aeronautics and Space

3rd Annual Meeting
June 5-6, 2001
NASA-Ames
Proposals Received and Awards
(through May 18, 2001)

TOTAL PROPOSALS RECEIVED (509)

- UNIVERSITY (189)
- HBCU (5)
- SDB (23)
- SMALL BUSINESS (252)
- NATIONAL LABS (13)
- LARGE BUSINESS (27)

AS OF 5/18/01

TOTAL NUMBER OF AWARDS (80)

- UNIVERSITY (34)
- HBCU (2)
- SDB (2)
- SMALL BUSINESS (35)
- NATIONAL LABS (0)
- LARGE BUSINESS (7)

AS OF 5/18/01

Future Events

Late Summer or Early Fall 2001
Release of Next Phase I Call for Proposals with a due date of early CY 2002

November 2001
NIAC Phase I Fellows Meeting and Workshop

June 2002
NIAC 4th Annual Meeting
Location - TBD
Phase I Awards
Call for Proposals: CP 00-02
Performance Period: June 1 – November 30, 2001
Astronaut Bio-Suit System for Exploration Class Missions

Dava Newman
Massachusetts Institute of Technology
A Chameleon Suit to Liberate Human Exploration of Space Environments

Edward Hodgson
Hamilton Sundstrand Space Systems International
A Flexible Architecture for Plant Functional Genomics in Space Environments

Terri Lomax
Oregon State University

Test Plant RNA → DNA Microarrays → Gene Isolation

Space Environmental Condition

Optimized Performance
Gene Modification

Gene Disruption → Functional Analysis
A Novel Information Management Architecture for Maintaining Long Duration Space Crews

- Agents transmit information to and from Mission Control.
- Agents ability to analyze information prior to moving saves bandwidth.
- Code and data can be updated throughout the mission, enabling increased performance and adaptation to mission conditions.

George Cybenko
Dartmouth College

Adaptive Observation Strategies for Advanced Weather Prediction

David Bacon
SAIC, Center for Atmospheric Physics

Michael Kaplan
North Carolina State University
Ross Hoffman
Atmospheric and Environmental Research, Inc.
Architecture of “Intelligent” Earth Observation Satellite for Common Users in 2010-2050

Guoqing Zhou
Old Dominion University
The SHIVA system uses multiple, selectable bands as commanded by remotely located users to search for, identify, and report geophysical events. A pointed telemetry system reduces the ground system requirements.
H. John Caulfield
Fisk University

- Analogous to how nature allows you to see a 3D image using only one eye at a hyperfocal distance from your eye
- Connected set of computer programs that start with any digitized 2D image and convert it into a pair of images for 3D visualization
- Will be tested on telescopic and microscopic images in Phase I
- Feasibility established for simple objects in the near field
- Will record simulated scenes of interest for NASA and blur them by various amounts digitally to simulate telescopic images
- Attempt 3D visualization of local regions
- Design software for a hardware system to be built in Phase II
Formation Flying with Shepherd Satellites

Michael LaPointe
Ohio Aerospace Institute
Propellantless Control of Spacecraft Swarms using Coulomb Forces

Brad King
Michigan Technology University

• Potentially feasible to generate tens of micro-Newton of attraction and repulsion between spacecraft separated by tens of meters.

• Net spacecraft charge can be controlled by harvesting ambient space-plasma electrons or actively emitting electrons.

• Mutually interacting Coulomb spacecraft will be oriented in stable minimum energy arrays that can be configured using active control.

• Advantages
  - Circumvent need for micro-thrusters in satellite swarms
  - Increase formation mission lifetimes by harvesting in-space resources
  - Greatly improve fine position-keeping through active feedback
  - Facilitate wider range of satellite formation
  - Increase swarm robustness through fault-detection and reconfiguration
Directed Application of Nanobiotechnology for the Development of Autonomous Biobots

Carlo Montemango
Cornell University
Europa Sample Return Mission utilizing High Specific Impulse Propulsion Refueled with Indigenous Resources

John Paniagua
Plus Ultra Technologies, Inc.
Achieving Comprehensive Mission
Robustness

John Rose
University of South Carolina

Deontology vs. teleology...
Do not harm the mission...
Maximize utility...

RDF/KIF/FIPA

Actions
External Influences and Sensory Inputs

Environment
Glenn Starkman  
Case Western Reserve University

- Occultation of an X-ray telescope by a steerable satellite may allow binary point source resolution better than milli-arcsecond with little or no re-design of X-ray telescopes.

- Model reconstructive capabilities of the technique and adjust satellite shape so as to maximize those capabilities.

- Evaluate possible scientific payback from implementing this approach in conjunction with planned facilities, such as Constellation-X.

- Occulter design considerations to be investigated.
  - Thickness
  - Size
  - Steerability
  - Binary point source resolution
  - Compound source resolution
  - Target sources
Ultra-Fast Laser-Driven Plasma for Space Propulsion

Terry Kammash
University of Michigan

Laser-Accelerated Plasma Propulsion System (LAPPS)
Jordin Kare
Kare Technical Consulting

N sails accelerate over $r \sim R / N$
**High Speed Interplanetary Tug / Cocoon Vehicles (HITVs)**

Nick Omidi
Scibernet, Inc.
9:00am – 10:00am **Keynote Speaker**

Dr. Bruce Jakosky, University of Colorado

10:00am – 10:30am **Break**

10:30am – 11:50am **NIAC Status Reports**

Dr. Ralph L. McNutt, Jr., Johns Hopkins Applied Physics
“A Realistic Interstellar Explorer”

Dr. Steven Dubowsky, Massachusetts Institute of Technology
“Self-Transforming Robotic Planetary Explorers”

11:50am - 1:00pm **Lunch** (on your own)
A Realistic Interstellar Explorer

Ralph McNutt, Jr., Johns Hopkins Applied Physics Lab
1:00pm - 3:00pm  **NIAC Status Reports**

Dr. Neville J. Woolf, Steward Observatory, University of Arizona
“Very Large Optics for the Study of Extrasolar Terrestrial Planets”

Dr. Paul Gorenstein, Smithsonian Institution, Astrophysical Lab
“An Ultra-High Throughput X-Ray Astronomy Observatory with a New Mission Architecture”

Dr. Webster Cash, University of Colorado
“X-Ray Interferometry”

3:00pm - 3:15pm  **Break**
Life Finder

Hubble Space Telescope (operational)

Next Generation Space Telescope (technology development)

Terrestrial Planet Finder (concept development)

Very Large Optics for the Study of Extrasolar Terrestrial Planets
Neville J. Woolf, Steward Observatory, University of Arizona
An Ultra-High Throughput X-Ray Astronomy Observatory with A New Mission Architecture

Paul Gorenstein, Smithsonian Institute, Astrophysical Observatory
3:15pm - 5:15pm  **NIAC Status Reports**

Bradley Edwards, Eureka Scientific
“The Space Elevator”

Dr. George Maise, Plus Ultra Technologies
“Exploration of Jovian Atmosphere using Nuclear Ramjet Flyer”

Dr. Kerry T. Nock, Global Aerospace
“Cyclical Visits to Mars via Astronaut Hotels”

5:30pm - 7:00pm  **Reception, Ames Cafe**
8:30am - 8:40am  **Welcome and Introduction of Keynote Speaker**  
Dr. Robert A. Cassanova, NIAC Director

8:40am - 9:40am  **Keynote Speaker**  
Dr. Eric Barron, Pennsylvania State University

9:40am – 10:20am  **NIAC Status Report**  
Dr. Robert M. Winglee, University of Washington  
“The Mini-Magnetospheric Plasma Propulsion, M² P²”

10:20am – 10:40am  **Break**

10:40am – 12:00pm  **NIAC Status Reports**  
Dr. Ilan Kroo, Stanford University  
“Mesicopter: A Meso-Scale Flight Vehicle”

Dr. Kerry T. Nock, Global Aerospace Corporation  
“Global Constellation of Stratospheric Scientific Platforms”

12:00pm - 1:00pm  **Lunch** *(on your own)*
Concept for interstellar propulsion and radiation shielding

Graphics by permission of New Scientist
Meso-Scale Flight Vehicle for Atmospheric Sensing
Ilan Kroo, Stanford University

The Concept: Applications

- Atmospheric Studies
  - Windshear, turbulence monitors
  - Biological/chemical hazard detection

- Planetary Atmospherics
  - Swarms of low-mass mobile robots for unique data on Mars
Global Constellation of Stratospheric Scientific Platforms
Kerry Nock, Global Aerospace Corporation
1:00pm - 3:00pm **NIAC Status Reports**

Dr. Robert P. Hoyt, Tethers Unlimited, Inc.
“*Moon & Mars Orbiting Spinning Tether Transport (MMOSTT)*”

Mr. John Grant, Boeing
“*Hypersonic Airplane Space Tether Orbital Launch Study*”

Dr. Eric E. Rice, Orbital Technologies Corporation
“*Advanced System Concept for Total ISRU Based Propulsion and Power Systems for Unmanned and Manned Mars Exploration*”

3:00pm - 3:15pm **Break**

3:15pm - 4:35pm **NIAC Status Reports**

Anthony Colozza, Ohio Aerospace Institute
“*Planetary Exploration using Biomimetics*”

Mr. Andrew Keith, Sikorsky Aircraft Corporation
“*Autonomous VTOL Scalable Logistics (AVSLA)*”

4:35pm **Adjourn**
Moon and Mars Orbiting Spinning Tether Transport (MMOSTT) Architecture

Robert P. Hoyt, Tethers Unlimited, Inc.
Hypersonic Airplane Space Tether Orbital Launch – HASTOL
John Grant, The Boeing Company
Advanced System Concept for Total ISRU-Based Propulsion and Power Systems for Unmanned and Manned Mars Exploration

Eric Rice, Orbital Technologies Corporation
Planetary Exploration Using Biomimetics
Anthony Colozza, Ohio Aerospace Institute

- Gas used to drive wings can be reused to create ultrasonic ranging signals.
- FMCW waveform allows Doppler insensitive range measurements.
- Wing and fuselage motions provide scanning mechanism for ultrasonic beam.
Methodology for Study of Autonomous VTOL Scalable Logistics Architecture

Andrew Keith, Sikorsky Aircraft Corporation