

## Table of Contents

### Volume 1

#### Track 1: Science & Aerospace Frontiers – Plenary Sessions

*Track Organizer: Bob Profet, Profet Enterprises*

1.0101 How Insects Fly .....	1-1
1.0102 Bridging the Gap Between Systems & Software Engineering .....	1-3
1.0103 DARPA: DoD's Engine for Revolutionary Change.....	1-5
1.0104 Creating Cutting Edge Partnerships with NASA Part I .....	1-7
1.0105 Creating Cutting Edge Partnerships with NASA Part II .....	1-9
1.0106 Self-Healing Composites.....	1-11
1.0107 Mapping the World in 3-D.....	1-13

#### Track 2: Space Missions, Systems, and Architecture

*Track Organizer: Guy K. Man, Jet Propulsion Laboratory, Caltech*

*Track Organizer: Marina Ruggieri, University of Roma Tor Vergata*

##### 2.01 Space Station Science Experiments

*Session Organizer: Richard Beatty, Jet Propulsion Laboratory*

*Session Organizer: Carlo Bonifazi*

2.0101 A Low Temperature Facility for Experiments on the International Space Station .....	1-15
2.0102 Science Definition and the Instrument Sensor Package for Critical Dynamics in Microgravity (DYNAMX) .....	1-23
2.0103 The CQ Experiment: Enhanced Heat Capacity of Superfluid Helium in a Heat Flux .....	1-31
2.0104 Laser-Cooled Atomic Clocks as Science Payloads on the International Space Station .....	1-41
2.0105 StarNav III: A Three Fields of View Star Tracker.....	1-47
2.0106 SPHERES: Development of an ISS Laboratory for Formation Flight and Docking Research .....	1-59

##### 2.02 Technology for Reliable Autonomous Control

*Session Organizer: Richard Abbott, Lockheed Martin Aeronautics*

*Session Organizer: Amir Fijany, Jet Propulsion Laboratory*

2.0201 The Fully Programmable Spacecraft: Procedural Sequencing for JPL Deep Space Missions Using VML.....	1-75
--	------

##### 2.03 Verification and Validation for the 21<sup>st</sup> Century Systems

*Session Organizer: Keyur Patel, Jet Propulsion Laboratory*

*Session Organizer: Charles Chidekel, Jackson & Tull*

2.0301 Modeling the Europa Pathfinder Avionics System with a Model Based Avionics Architecture Tool .....	1-83
2.0302 Distributed Computing for Autonomous On Board Planning and Sequence Validation.....	1-93
2.0303 Using Spin Model Checking for Flight Software Verification.....	1-105
2.0304 Technology Portfolio Options for NASA Missions using Decision Trees .....	1-115
2.0305 Integration and Test for Small Shuttle Payloads .....	1-127

##### 2.04 Deep Space and Discovery Mission Architecture and Payload

*Session Organizer: Young Park, Jet Propulsion Laboratory*

*Session Organizer: Robert Richie, Nasa Langley Research Center*

2.0401 Deep Impact, The Mission.....	1-147
2.0402 2001 Mars Odyssey Payload Suite – The Long, Arduous Journey to Launch.....	1-157
2.0403 An Overview of the Mars Reconnaissance Orbiter Mission.....	1-171
2.0404 SpaceTime: A Mission with Profound Science at Low Cost .....	1-181
2.0405 The Europa Orbiter Radar Sounder: Innovative Radar Design for a Challenging Mission .....	1-189

## Table of Contents

### **2.05 Autonomous Systems of the 21<sup>st</sup> Century**

*Session Organizer: Nicola Muscettola, NASA Ames Research Center*

*Session Organizer: Abdullah Aljabri, Jet Propulsion Laboratory*

2.0501 State Knowledge Representation in the Mission Data System.....	1-195
2.0502 Payload State of Health Monitoring Design for Next Generation Satellite Constellations.....	1-205
2.0503 Vision-Based Following for Cooperative Astronaut-Robot Operations .....	1-215

### **2.06 Space Technology Missions**

*Session Organizer: Ronald Ticker, NASA Goddard Space Flight Center*

*Session Organizer: Christopher Stevens, Jet Propulsion Laboratory*

2.0601 The DAVID Scientific Satellite: Mission Analysis and Orbit Selection .....	1-225
2.0602 The DAVID Satellite Payload.....	1-231
2.0603 StarLight Spacecraft Concept Descriptions .....	1-239
2.0604 Flight Computer Design for the Space Technology 5 (ST-5) Mission.....	1-255
2.0605 Modeling Radiation-Induced Transients in the Next Generation Space Telescope (NGST).....	1-271
2.0606 Analysis of the New Millennium Program (NMP) Flight Validation Process Using PTAM .....	1-281

### **2.07 Missions, Systems and Instruments for In Situ Exploration**

*Session Organizer: Geoffrey Briggs*

*Session Organizer: Patricia Beauchamp, JPL/Caltech*

2.0701 Mission Architectures for the Exploration of the Lunar Poles .....	1-295
2.0702 The Mars '07 North Polar Cap Deep Penetration Cryo-Scout Mission .....	1-305
2.0703 SNOOPY: Student Nanoexperiments for Outreach and Observational Planetary Inquiry.....	1-317
2.0704 Titan Airship Explorer .....	1-327
2.0705 The Potential for Chemical Evolution on Titan.....	1-337
2.0706 Ice-Embedded Transceivers for Europa Cryobot Communications .....	1-349
2.0707 IPSE: Italian Package for Scientific Experiments .....	1-357
2.0708 Rotorcraft as Mars Scouts.....	1-367
2.0709 In-Situ Site Knowledge System .....	1-379
2.0710 Polar Traverse Rover Development for Mars, Europa and Earth .....	1-389
2.0711 NEPTUNE: An Under-sea Plate Scale Observatory.....	1-397
2.0712 Advanced Electronic Tongue Concept .....	1-407
2.0713 Subsurface Water Search by TEM .....	1-417

### **2.08 CubeSat satellite program**

*Session Organizer: Robert Twiggs, Stanford University*

*Session Organizer: Jordi Puig-Suari, Aerospace Engineering Dept.*

2.0801 BioExplorer Bus- Low Cost Approach .....	1-427
2.0802 CubeSat Design for LEO-Based Earth Science Missions.....	1-435
2.0803 Sun Oriented and Powered, 3 Axis and Spin Stabilized Cubesats.....	1-447
2.0804 Development of a Family of Picosatellite Deployers Based on the CubeSat Standard .....	1-457
2.0805 Power Subsystem Design for the Montana EaRth Orbiting Pico-Explorer (MEROPE) Cubesat-class Satellite .....	1-465
2.0806 A Commercial Off the Shelf (COTS) Packet Communications Subsystem for the Montana EaRth-Orbiting Pico-Explorer (MEROPE) Cubesat .....	1-473
2.0807 Micropropulsion Experiment on UNISAT-2.....	1-479
2.0808 Microcontroller Design for the Montana EaRth Orbiting Pico-Explorer (MEROPE) Cubesat-class Satellite.....	1-487

## Table of Contents

### Volume 2

#### 2.09 21<sup>st</sup> Century Space Science Missions

*Session Organizer: Antonio Martinez de Aragon, -ESTEC*

*Session Organizer: Robert Gershman, Jet Propulsion Laboratory*

2.0901 Mars Sample Return Studies for a Fresh Look .....	2-493
2.0902 Mars Sample Return A Robust Mission Approach for “Getting the Right Sample” .....	2-511
2.0903 Mars Sample Return: Architecture and Mission Design .....	2-523
2.0904 Mars Sample Return: The Design of Low Risk Architectures .....	2-537
2.0905 Mars Sample Return Mission Studies Leading to a Reduced-Risk Dual-Lander Mission using Solar Electric Propulsion.....	2-549
2.0906 Mars Sample Return, A Concept Point Design by Team-X (JPL’s Advanced Project Design Team).....	2-559
2.0907 Challenges in Developing the Microwave Instrument for the Rosetta Orbiter .....	2-575
2.0908 Technological Spin-Offs of the PMST Program of the Italian Space Agency (ASI) .....	2-583
2.0909 Scientific Operations of the W-Band Experiment During the DAVID Satellite Mission .....	2-591
2.0910 Current Status of Mars Scouts .....	2-601
2.0911 In Search of New Worlds: NASA’s Astronomical Search for Origins .....	2-607
2.0912 Site Selection and Deployment Scenarios for Servicing of Deep-Space Observatories.....	2-617
2.0913 Fast in situ Measurements of Ionospheric Plasma with the Miniature Electrostatic Analyzer (MESA) .....	2-631

#### 2.10 Risk Management Methodologies and Techniques for Space Missions

*Session Organizer: Richard Grammier, Jet Propulsion Laboratory*

*Session Organizer: James Watzin, NASA/GSFC*

2.1001 Risk Management at JPL Practices and Promises.....	2-641
2.1002 That Ones Gotta Work Mars Odysseys use of a Fault Tree Driven Risk Assessment Process .....	2-651
2.1003 Operations Safety Risk Management: Managing Integration and Test Safety Risk .....	2-673
2.1004 Reliability Modeling for the Space Interferometry Mission.....	2-689
2.1005 Managing Risk for Cassini During Mission Operations and Data Analysis .....	2-705
2.1006 Risk Assessment of TMD/NMD – Inevitability of Space Militarization .....	2-715
2.1007 Risk Management Tools for Complex Project Organizations .....	2-721

#### 2.11 Constellation Missions

*Session Organizer: John Bristow, NASA*

*Session Organizer: Maurice Martin, Air Force Research Laboratory*

2.1101 Electromagnetic Formation Flight For Sparse Aperture Telescopes .....	2-729
2.1102 Enabling Distributed Spacecraft System Operations with the Crosslink Transceiver .....	2-743
2.1103 Assessment of decentralized satellite formation control with distributed hardware-in-the-loop testbeds.....	2-757
2.1104 Requirements Analysis for a Multi-Spacecraft Flight System .....	2-767
2.1105 Autonomous Satellite Formation Assembly and Reconfiguration with Gravity Fields.....	2-783
2.1106 Derivation of Stability Requirements and Control Effort Analysis for Space Nulling Interferometers.....	2-797
2.1107 The BISSAT Mission: a Bistatic SAR Operating in Formation with COSMO/SkyMed X-band Radar .....	2-809

### Track 3: Antennas: Modern Developments

*Track Organizer: Yahya Rahmat-Samii, UCLA*

*Track Organizer: Mark W. Thomson, TRW Astro Aerospace*

#### 3.01 Antenna Technologies/Phased Arrays

*Session Organizer: Walt Gregorwich, Lockheed Martin Advanced Technology Center*

3.0101 Pattern Synthesis for a Conformal Wing Array .....	2-819
3.0102 Multipath Scattering Compensation for Low Sidelobe Pattern Synthesis on a Complex Platform.....	2-827
3.0103 Mitigation of Jamming of an Angle Estimation System Using Multi-mode Antennas .....	2-833

## Table of Contents

3.0104 High Capacity Phased Array Antennas for Theater Recce/Intel Networks .....	2-841
3.0105 Re-configurable Array Antennas for Wideband Applications .....	2-855
3.0106 Antenna and Phased Array Implementations Using Engineered Substrates .....	2-863
3.0107 Adaptive Polarization for Spacecraft Communications Systems .....	2-875
3.0108 A Novel Multibeam Approach for a GEO Positioning Spacecraft System.....	2-885
3.0109 Phase Synthesis of Antennas.....	2-891
<b>3.02 Space and Ground Antenna Technologies and Systems</b>	
<i>Session Organizer: Farzin Manshadi, Jet Propulsion Laboratory</i>	
3.0201 Exploring the Next Generation Deep Space Network.....	2-901
3.0202 Array Antennas for JPL/NASA Deep Space Network.....	2-911
3.0203 Deployable Microwave Lens Antennas.....	2-923
3.0204 Compact Wireless Antennas using an Artificial Dielectric Lens.....	2-931
3.0205 Scanning Techniques for Estimation of Spacecraft Position .....	2-939
3.0206 RF Characterization of the Mars Exploration Rover Radar Altimeter Antennas-Airbag Interaction .....	2-949
3.0207 Spectral Domain Analysis of Doped Electromagnetic Crystal Radomes Using the Method of Moments.....	2-957
<b>3.03 Large Aperture Antennas</b>	
<i>Session Organizer: Mark Thomson, TRW Astro Aerospace</i>	
<i>Session Organizer: Yahya Rahmat-Samii, UCLA, Engineering 4 Bldg</i>	
3.0301 Hybrid Antenna and Scattering Matrix Based Beamformer for Wide-Angle Scanning.....	2-965
3.0302 A Novel Antenna Concept for Future Solar Sails Missions.....	2-981
3.0303 Blockage Minimization in Cassegrain and Gregorian Reflectors with Increased Flexibility .....	2-999
<b>3.04 Air and Space borne Radar, SAR and IFSAR Systems and Technologies</b>	
<i>Session Organizer: Harold Malliot, High Altitude Mapping Missions, Inc.</i>	
3.0401 The Wide Swath Ocean Altimeter: Radar Interferometry for Global Ocean Mapping with Centimetric Accuracy .....	2-1007
3.0402 Ku-Band Receiver and Transmitter for Breadboard DSP Scatterometer.....	2-1023

## Table of Contents

### Volume 3

#### Track 4: Communications and Navigation

*Track Organizer: Shirley Tseng*

*Track Organizer: Phil A. Dafesh, Aerospace Corporation*

##### **4.01 Commercial/Military Space application**

*Session Organizer: Doug Holker, The Aerospace Corporation*

- 4.0101 Sirius Satellite Radio: Radio Entertainment in the Sky .....3-1031  
4.0102 Military Applications for Digital Audio Radio Service (DARS) .....3-1039

##### **4.02 Worldwide Deployment of Ka band systems**

*Session Organizer: Shirley Tseng*

- 4.0201 Applying Radar Data to Predict the Performance of Ka-Band Spot Beam Systems in the Presence of Rain .....3-1051

##### **4.03 Communication for Autonomous Inter-Satellite Networks**

*Session Organizer: Jeffrey Hayden, PresciPoint Solutions, L.L.C.*

*Session Organizer: Kul Bhasin, NASA Glenn Research Center*

- 4.0301 Space Network Architecture Technologies .....3-1061  
4.0302 Local Area Network for Space-Based Instrument Control .....3-1071  
4.0303 Comparison of IEEE 802.11 and Wireless 1394 for Intersatellite Links in Formation Flying .....3-1077

##### **4.04 Communications for Self-Organizing Sensor Networks**

*Session Organizer: Loren Clare, Jet Propulsion Laboratory/CalTech*

- 4.0401 A Layered Architecture for Location-based Services in Wireless Ad Hoc Networks .....3-1085  
4.0402 STEM: Topology Management for Energy Efficient Sensor Networks .....3-1099  
4.0403 Load Balanced, Energy-Aware Communications for Mars Sensor Networks .....3-1109  
4.0404 An Adaptive Network/Routing Algorithm for Energy Efficient Cooperative Signal Processing in Sensor Networks .....3-1117  
4.0405 PEGASIS: Power-Efficient Gathering in Sensor Information Systems .....3-1125

##### **4.05 Mobile Communication in Diagnostics**

*Session Organizer: Brian Glass, NASA Ames Research Center*

- 4.0501 Analysis and Testing of Mobile Wireless Networks .....3-1131

##### **4.06 Advanced Communications, Navigation, & Surveillance Technology for National Airspace**

*Session Organizer: Denise Ponchak, Ms. Denise S. Ponchak*

- 4.0601 Development of an Airborne Internet Architecture to Support SATS: Trends and Issues .....3-1145  
4.0602 Communications, Navigation and Surveillance (CNS) Technology Needs (Gap) Assessment .....3-1153  
4.0603 Aeronautical Communications Research and Development Needs for Future Air Traffic Management Applications ...3-1169  
4.0604 Simulation and Performance of Data Communication Using AMSS .....3-1177  
4.0605 Comparison of VDL Modes in the Aeronautical Telecommunications Network .....3-1183  
4.0606 CSMA versus Prioritized CSMA for Air-Traffic-Control Improvement .....3-1191

##### **4.07 Communications and Navigation, Sensor and Data Fusion, or Tracking**

*Session Organizer: Thomas Huynh, Advanced Technology Center*

- 4.0701 Digital Costas Loop Design for Coherent Microsatellite Transponders .....3-1197  
4.0702 On the Diameter of Sensor Networks .....3-1211  
4.0703 A Wireless Token Ring Protocol for Ad-Hoc Networks .....3-1219  
4.0704 A Token-based Greedy Chain Scheduling Algorithm (T-GCSA) for Situation Aware Wireless LANs .....3-1229

##### **4.08 Interference issues in Wireless Communication**

*Session Organizer: Tien Nguyen, The Aerospace Corporation*

- 4.0801 Modeling and Simulation Analyses of Satellite Radio Frequency Interference .....3-1239

## Table of Contents

### **4.09 Communications Systems Development**

*Session Organizer: Timothy Pham, Jet Propulsion Laboratory*

4.0901 TRWs Broadband Communication Payloads at C and Ku Frequency Bands .....	3-1247
4.0902 PRIMA Capabilities for DAVID Communication Experiment .....	3-1257

### **4.10 Deep Space Communication Issues**

*Session Organizer: Jeff Berner, Jet Propulsion Laboratory*

4.1001 Maximization of Data Return at X-band and Ka-band at DSNs 34-meter Beam-Waveguide Antennas .....	3-1263
4.1002 Communicating with Mars During Periods of Solar Conjunction .....	3-1271
4.1003 Critical Spacecraft-to-Earth Communications for Mars Exploration Rover (MER) Entry, Descent and Landing .....	3-1283
4.1004 Resolving the Cassini/Huygens Really Radio Anomaly .....	3-1295
4.1005 A Two-way Noncoherent Ranging Technique for Deep Space Missions .....	3-1303
4.1006 Operations Comparison of Deep Space Ranging Types: Sequential Tone vs. Pseudo-Noise .....	3-1313
4.1007 Carrier Synchronization of Offset QPSK for Deep Space Telemetry .....	3-1327
4.1008 Spacecraft Transponder for Deep Space Applications: Design and Performance .....	3-1337

### **4.11 Wide Bandwidth Communication**

*Session Organizer: Tien Nguyen, The Aerospace Corporation*

4.1101 Performance Evaluation of Two Rate 2/3 Turbo Code Configurations .....	3-1349
---	--------

### **4.12 Advanced Communication Signal Processing**

*Session Organizer: Phil Dafesh, The Aerospace Corporation*

4.1201 Iterative Demodulation and Decoding for a Mobile Packet System with Parallel Concatenated Trellis-Coded Modulation ....	3-1355
--	--------

### **4.13 GPS System**

*Session Organizer: Larry Vittorini, Conexant Systems, Inc.*

*Session Organizer: Steven Lazar, The Aerospace Corporation*

4.1301 GPS and INS Flight Test Instrumentation of a Fully Aerobatic Turbojet Aircraft .....	3-1361
---	--------

## **Track 5: Optics, Electro-Optics and Lasers**

*Track Organizer: G. Charmaine Gilbreath, Naval Research Laboratory*

*Track Organizer: Paul McManamon, Air Force Research Laboratory*

### **5.01 Opto-Electronic Devices and Interconnects**

*Session Organizer: Franz Haas, Air Force Research Laboratory*

5.0101 Comparison of Radiation-Induced Passive and Dynamic Responses in Two Erbium-Doped Fiber Lasers .....	3-1369
5.0102 Heterogeneous Integration of EO Polymers with Micro-Mechanical Resonant Structures .....	3-1381

### **5.02 Large Optics in Space**

*Session Organizer: James Bilbro, George C. Marshall Space Flight Center*

5.0201 Fabrication of C-SiC Composite Mirrors .....	3-1389
---	--------

### **5.03 Optical Phased Array Technology**

*Session Organizer: Edward Watson, Air Force Research Laboratory, Sensors Directorate*

5.0301 Advanced Liquid Crystal on Silicon Optical Phased Arrays .....	3-1395
5.0302 Large Scale Modulator Arrays for Beam Steering and Optical Modulator Applications .....	3-1403
5.0303 Broadband OPA device for MWIR Beam Steering .....	3-1411
5.0304 Continuous Beam Shaping with Optical Phased Arrays using Diffractive Optics Optimization .....	3-1417
5.0305 Phasing Optical Phased Arrays Using an Exact Solution for Adaptive Optics .....	3-1423
5.0306 Implementing Optical Phased Array Beam Steering with Cascaded Microlens Arrays .....	3-1429

## Table of Contents

### **5.04 Infrared Technology**

*Session Organizer: Paul LeVan, Air Force Research Laboratory*

5.0401 Large Format Long-Wavelength GaAs/AlGaAs Multi-Quantum Well Infrared Detector Arrays for Astronomy .....	3-1437
---	--------

### **5.05 Laser Radar and Satellite Laser Ranging**

*Session Organizer: Gary Kamerman*

5.0501 Adaptive Laser System for Active Remote Object Tracking .....	3-1445
5.0502 Design and Performance of the Vegetation Canopy Lidar (VCL) Laser Transmitter .....	3-1457

### **5.06 Free Space Optical Communications**

*Session Organizer: Hamid Hemmati, Jet Propulsion Laboratory*

5.0601 Phased Array of Phased Arrays (PAPA) Laser Systems Architecture.....	3-1465
5.0602 Adaptive Thresholding for Free-space Optical Communication Receivers with Multiplicative Noise.....	3-1473
5.0603 A High-Speed Modulated Retro-reflector for Lasers.....	3-1481
5.0604 A High-Speed Retro-reflector for Free-Space Communication Based on Electro-Optic Phase Modulation .....	3-1487

## **Track 6: Remote Sensing**

*Track Organizer: Thia Kirubarajan, University of Connecticut*

*Track Organizer: Peter K. Willett, University of Connecticut*

### **6.01 Hyperspectral Science and Applications**

*Session Organizer: Jeffrey Bowles, Naval Research Laboratory*

6.0101 Hyperion Data Collection: Performance Assessment and Science Application.....	3-1493
6.0102 Comparison of EO-1 Hyperion and Airborne Hyperspectral Remote Sensing data for Geologic Applications .....	3-1501
6.0103 Using Hyperspectral Imaging to Characterize the Coastal Environment .....	3-1515
6.0104 Resolution Enhancement of Hyperspectral Data .....	3-1523
6.0105 Using Self-Organizing Maps for Anomaly Detection in Hyperspectral Imagery.....	3-1531
6.0106 Hyperspectral Target Detection using a Bayesian Likelihood Ratio Test .....	3-1537

## Table of Contents

### Volume 4

#### 6.02 Tracking Applications

*Session Organizer: Yaakov Bar-Shalom, Univ of Connecticut*

6.0201 Tracking Closely-Spaced, Possibly Unresolved, Rayleigh Targets: Idealized Resolution .....	4-1543
6.0202 One-Step Solution for the General Out-of-Sequence-Measurement Problem in Tracking .....	4-1551
6.0203 Maximum Likelihood Geolocation using a Ground Moving Target Indicator (GMTI) Report.....	4-1561
6.0204 On the Usage of Derived Quantities in Tracking: Energy and Other Estimators .....	4-1571
6.0205 An Efficient Adaptive Sequential Procedure for Detecting Targets.....	4-1581
6.0206 Aspects of Measurement Scheduling for Tracking .....	4-1597
6.0207 Hierarchical Multi-Hypothesis Tracking with Application to Multi-Scale Sensor Data .....	4-1609
6.0208 Discrete-Space Particle Filters for Reflecting Diffusions.....	4-1625

#### 6.03 Processing and Phenomenology

*Session Organizer: Brian Hibbeln, US Naval Postgraduate School*

*Session Organizer: Susan Hagerty, Ball Aerospace & Technologies Corp*

6.0301 Remote Sensing System Optimization .....	4-1635
6.0302 Developing a Remote Sensor for Optimizing Successful Boost Phase Intercept .....	4-1649
6.0303 Automatic Video Segmentation in the Compressed Domain .....	4-1663

#### 6.04 Interferometric Systems and Technologies for Remote Sensing

*Session Organizer: Peter Kahn, Jet Propulsion Laboratory*

6.0401 The Space Interferometry Mission (SIM): Technology Development Progress and Plans .....	4-1669
6.0402 Comparison of High Dynamic Range Near-Neighbor Detection Approaches for TPF .....	4-1685
6.0403 Optical Alignment of the TES Cryogenic Interferometer .....	4-1695
6.0404 The StarLight Formation-Flying Interferometer System Architecture.....	4-1703
6.0405 The StarLight Metrology Subsystem.....	4-1721
6.0406 Metrology Sensor Characterization and Pointing Control for the Formation Interferometer Testbed (FTT).....	4-1737
6.0407 Starlight Pointing Subsystem for the Formation Interferometer Testbed (FIT) .....	4-1747
6.0408 Space Interferometry Mission: Recent Instrument Configuration Developments.....	4-1759

#### 6.05 Particle Filtering and Markov Chain Monte Carlo Techniques

*Session Organizer: Neil Gordon*

*Session Organizer: Simon Maskell, QinetiQ*

6.0501 Rao-Blackwellised Particle Filtering for Fault Diagnosis.....	4-1767
6.0502 Tracking a Ballistic Re-entry Vehicle with a Sequential Monte-Carlo Filter .....	4-1773
6.0503 A Particle Filtering Approach to FM-Band Passive Radar Tracking and Automatic Target Recognition .....	4-1789
6.0504 Out-of-Sequence Measurement Processing for Tracking Ground Target Using Particle Filters.....	4-1809

### Track 7: Spacecraft Avionics, Systems, and Technologies

*Track Organizer: John R. Samson, Jr., Honeywell Inc.*

*Track Organizer: Leon Alkalai, Jet Propulsion Laboratory, Caltech*

#### 7.01 Onboard Processing Hardware Architectures and Interconnect Technologies

*Session Organizer: Edward Prado, Honeywell Inc.*

7.0101 Adaptive Computer Systems .....	4-1819
7.0102 The Strategic Issues with Implementing Open Avionics Platforms for Spacecraft.....	4-1825
7.0103 Intel Architecture for Military and Space Applications.....	4-1843
7.0104 Automotive Electronics in Space .....	4-1857
7.0105 Feasibility of using SA1100 Processor in Micro Satellite Environment.....	4-1871



## Table of Contents

### **7.02 Onboard Command and Data Handling, Signal, and Data Processing Technologies**

*Session Organizer: Michael McLelland, Southwest Research Institute*

7.0201 Testbed for Development of a DSP-Based Signal Processing Subsystem for an Earth-Orbiting Radar Scatterometer.....	4-1881
7.0202 Multiplierless Algorithms for High-Speed Real-Time Onboard Image Processing.....	4-1891
7.0203 Evolution of Digital Signal Processing Based Spacecraft Computing Solutions.....	4-1899
7.0204 FPGA CCSDS Command Decoder with BCH EDAC and Level-0 Command Execution .....	4-1909
7.0205 Integrating CCSDS and MIL-STD-1553: What You Should Know.....	4-1917
7.0206 Ethernet for Space Flight Applications .....	4-1927

### **7.03 Reconfigurable Computing Technologies**

*Session Organizer: Steven Clark, AFRL*

7.0301 Reconfigurable Systems: A Generalization of Reconfigurable Computational Strategies for Space Systems .....	4-1935
7.0302 LavaCORE – Configurable Java Processor Core.....	4-1953
7.0303 Delay Insensitive NCL Reconfigurable Logic .....	4-1961
7.0304 Low-Power Reconfigurable Processor .....	4-1969
7.0305 Pre-Hardware Optimization of Spacecraft Image Processing Software Algorithms and Hardware Implementation.....	4-1975

### **7.04 Mixed Signal and System-On-a-Chip Technologies**

*Session Organizer: Nikolaos Paschalidis, The Johns Hopkins University*

*Session Organizer: Creigh Gordon, AFRL/VSSE*

7.0401 Advanced System on a Chip Microelectronics for Spacecraft and Science Instruments.....	4-1993
7.0402 Design of Radiation Tolerant CMOS APS System-on-a-Chip Image Sensors .....	4-2005
7.0403 RF/Analog/Digital SOI Technology for GPS Receivers and Other Systems on aChip .....	4-2013
7.0404 An Overview of Sandia National Laboratories' MEMS Activities .....	4-2019

## Table of Contents

### Volume 5

#### **7.05 Spacecraft Software Systems and Applications – Data Analysis, Autonomous Operation, and Fault Tolerance**

*Session Organizer: Tom Hoffman, Jet Propulsion Laboratory*

*Session Organizer: Robert Ferraro, Jet Propulsion Laboratory*

7.0501 Stereo Vision and Rover Navigation Software for Planetary Exploration.....	5-2025
7.0502 Onboard Autonomous Rock Shape Analysis for Mars Rovers .....	5-2037
7.0503 Up-the-Ramp Processing and Cosmic Ray Rejection with Limited Memory .....	5-2053
7.0504 Onboard Processing of Orbital Hyperspectral Thermal Infrared Images .....	5-2061
7.0505 Onboard Science Software Enabling Future Space Science and Space Weather Missions .....	5-2071
7.0506 Modeling Relationships Using Graph State Variables .....	5-2085
7.0507 On-board Management of Multiple Processor Spacecraft System .....	5-2101
7.0508 Strategies for Fault-Tolerant, Space-Based Computing: Lessons Learned from the ARGOS Testbed .....	5-2109
7.0509 Radiation Fault Modeling and Fault Rate Estimation for a COTS Based Space-borne Supercomputer.....	5-2121
7.0510 Fault Injection Experiment Results in Space Borne Parallel Application Programs.....	5-2133
7.0511 Fault-Tolerant Systems Design Estimating Cache Contents and Usage.....	5-2149
7.0512 Minimizing the Overhead of Dynamic Scheduling Strategies in Avionics Systems .....	5-2159

#### **7.06 Packaging Electronics for Space – Chips, Modules, Boards, Chassis, and Spacecraft**

*Session Organizer: Bill Bjorndahl, TRW*

7.0601 Self-engaging Connector System for Robotic Outposts and Reconfigurable Spacecraft .....	5-2165
7.0602 Application Specific Connector Systems .....	5-2171
7.0603 Enabling Technologies for Integrated System-on-a-Package for the Next Generation Aerospace Applications .....	5-2177
7.0604 Integrated Avionics System (IAS), Integrating 3-D Technology on a Spacecraft Panel.....	5-2185

#### **7.07 Attitude, Determination, and Control – Sensors, Algorithms, and Technologies**

*Session Organizer: Carl Liebe, Jet Propulsion Laboratory*

7.0701 Estimating the Position of a Sphere from Range Images .....	5-2193
7.0702 Spacecraft Attitude Estimation based on Magnetometer Measurements and the Covariance Intersection Algorithm.....	5-2205
7.0703 Controlling the Attitude of Linear Time-Varying Model LEO Satellite Using Only Electromagnetic Actuation.....	5-2221
7.0704 Optimization Techniques for Orbit Estimation and Determination to Control the Satellite Motion .....	5-2231
7.0705 Sun Sensing on the Mars Exploration Rover .....	5-2249
7.0706 Micro Sun Sensor .....	5-2263
7.0707 Self-Organizing Guide Star Selection Algorithm for Star Trackers: Thinning Method.....	5-2275
7.0708 Micro APS Based Star Tracker.....	5-2285
7.0709 Maneuver Simulation of a Non-Linear System using Membership Function Optimization of a Fuzzy Logic Controller .....	5-2301
7.0710 On-Orbit Magnetic Field Correction of Magnetometers and Geometry-Based Attitude Determination for Small Satellites.....	5-2309
7.0711 Star Field Feature Characterisation for Initial Acquisition by Neural Networks .....	5-2319

#### **7.08 Evolvable Hardware for Space Systems**

*Session Organizer: Taher Daud, Jet Propulsion Laboratory*

7.0801 System Identification by Genetic Algorithm .....	5-2331
.....	5-2339
7.0803 A Cellular Automata FPGA Architecture that can be Trained for Neural Networks .....	5-2347

#### **7.09 Electronics for Extreme Environments**

*Session Organizer: Jagdish Patel, Jet Propulsion Laboratory*

*Session Organizer: Michael Newell, Jet Propulsion Laboratory*

*Session Organizer: Elizabeth Kolawa, Jet Propulsion Laboratory*

7.0901 Foreign Comparative Test of Space Qualified Digital Signal Processors .....	5-2355
--	--------

## Table of Contents

### **7.10 Emerging Technologies – MEMS, Neural Networks, Fuzzy Logic, and Hybrid Systems**

*Session Organizer: William Jackson, Ball Aerospace & Technologies Corp.*

7.1001 A High-Temperature Superconductor – Magnet Energy Storage and Attitude Control System for Space MEMS .....	5-2365
7.1002 A Stochastic Optimization Tool for Determining Spacecraft Avionics Box Placement .....	5-2373
7.1101 Retention Reliability Enhanced SONOS NVSM with Scaled Programming Voltage .....	5-2383

### **Track 8: Spacecraft and Launch Vehicle Systems and Technologies**

*Track Organizer: Jerry Sellers, USAF Academy*

#### **8.01 Enabling Technologies for Micro/Nano Spacecraft**

*Session Organizer: Michael Stallard, The Aerospace Corporation*

8.0101 Bounding the Problem: Microsatellite Design Using Commercial-Off-The-Shelf Architecture. ....	5-2391
8.0102 Low Power Radiation Tolerant VLSI for Advanced Spacecraft .....	5-2401
8.0103 Miniature Imaging Plasma Spectrometer: A New Approach with Large Geometric Factor and Wide Field of View .....	5-2407
8.0104 Empirical Modeling of Observed Microchannel Flow .....	5-2417

#### **8.02 Materials for Future Space Systems**

*Session Organizer: Suraj Rawal, Lockheed Martin Astronautics*

8.0201 High Thermal Conductivity Composites for Laser Diode Applications .....	5-2423
--	--------

#### **8.03 Power Subsystem Architectures and Technologies**

*Session Organizer: Abbas Salim, Lockheed Martin Missiles & Space Operations*

8.0301 Advanced Solar Tile Design and Performance .....	5-2429
8.0302 A Lightweight, High Reliability, Single Battery Power System for Interplanetary Spacecraft .....	5-2433
8.0303 Capabilities and Technical Issues Regarding the Stirling Radioisotope Generator .....	5-2445
8.0304 X2000 Power System Electronics Development .....	5-2453

#### **8.04 Launch Options for Micro/Nano Satellites**

*Session Organizer: Ruth Moser, AFRL/VSC*

8.0401 Multiple Payload Adapters; Opening the Doors to Space .....	5-2467
8.0402 Development of a Low-Cost, Modular, Reliable, Shuttle-Launched Payload Booster .....	5-2475

### **Track 9: Air Vehicle Systems and Technologies**

*Track Organizer: T. Glenn Coleman, Northwestern University*

#### **9.01 Air Vehicle Flight Testing**

*Session Organizer: Christian Rice, Naval Air Systems Command*

9.0101 Causes and Effects of Autothrottle Integrator Saturation on the Performance of the Approach Power Compensator of the S-3B Digital Flight Data Computer .....	5-2481
This page intentionally left blank .....	5-2493
9.0103 Tiltrotor Analytic Flight Test and Training Support .....	5-2501
9.0104 Instrument Meteorological Conditions (IMC) Certification of the MH-60S Helicopter Common Cockpit .....	5-2511

#### **9.02 Air Vehicle Guidance and Control**

*Session Organizer: David Doman, Air Force Research Laboratory*

9.0201 Evolution as a Guide for Autonomous Vehicle Path Planning and Coordination .....	5-2527
---	--------

#### **9.03 Intelligence, Surveillance, and Reconnaissance Air Vehicle Test Programs**

*Session Organizer: Brian Kish, Joint STARS Test Force*

9.0301 Demonstration of the JEDI System on Joint STARS .....	5-2537
9.0302 Affordable Moving Surface Target Engagement .....	5-2545

## Table of Contents

### Track 10: Software and Computing

*Track Organizer: Sanda Mandutiana, Jet Propulsion Laboratory*

#### **10.01 Software Development Methodologies**

*Session Organizer: Joseph Urban, Arizona State University*

10.0101 Automated Workflow for Engineering Services .....	5-2553
10.0102 Software Quality Assurance Engineering at NASA.....	5-2569
10.0103 An Investigation of Techniques for Addressing Software Affordability .....	5-2577
10.0104 Virtual Engineering and Science Team – Reusable Autonomy for Spacecraft Subsystems.....	5-2587

#### **10.02 Agent-Based Systems for Aerospace**

*Session Organizer: Sanda Mandutianu, Jet Propulsion Laboratory*

10.0201 Integrated Tools for Mission Operations Teams and Software Agents.....	5-2599
10.0202 The Automated Wingman – Using JACK Intelligent Agents for Unmanned Autonomous Vehicles .....	5-2615
10.0203 Smart Aerospace eCommerce: Using Intelligent Agents in a NASA Mission Services Ordering Application .....	5-2623
10.0204 A Test Agent for Testing Agents and their Communities.....	5-2633
10.0205 A Component Framework Supporting Peer Services for Space Data Management.....	5-2639

## Table of Contents

### Volume 6

#### **10.03 Component-based Software Development**

*Session Organizer: Jon Whittle, NASA Ames Research Center*

*Session Organizer: John Penix, NASA Ames Research Center*

10.0301 Selection of Components for OTS Component-based Systems .....6-2651

10.0302 The Component-based Environment for Remote Sensing .....6-2661

#### **10.04 Information Operations/Information Assurance (IO/IA)**

*Session Organizer: Robert Popp, DARPA*

10.0401 LARIAT: Lincoln Adaptable Real-time Information Assurance Testbed .....6-2671

10.0402 Current Threats to and Technical Solutions for Voice Security .....6-2685

10.0403 Anetwork-Centric UAV Organization for Search and Pursuit Operations .....6-2697

10.0404 Minuteman: Forward Projection of Unmanned Agents Using the Airborne Internet .....6-2715

10.0405 TBONE: A Mobile-Backbone Protocol for Ad Hoc Wireless Networks .....6-2727

10.0406 Tactical Information Operations for Autonomous Teams of Unmanned Aerial Vehicles (UAVs).....6-2741

10.0407 Greedy Adaptive Fano Coding .....6-2757

#### **10.05 Information Management for the C2 Warrior**

*Session Organizer: Paul Phister, Air Force Research Laboratory*

10.0501 An Agent-Based and Market-Oriented Approach to Distributed ISR Research Allocation .....6-2771

#### **10.06 Advanced Computational Methods**

*Session Organizer: Randy Haupt, Utah State University*

10.0601 A Cyclic Subgraph Methodology for Estimating de Bruijn Weight Class Distributions .....6-2781

### **Track 11: Diagnostics, Prognostics, and Health Management**

*Track Organizer: Andrew J. Hess, NAVAIR 4.4.2*

*Track Organizer: David L. Kleinman, Naval Postgraduate School*

#### **11.01 Test, Verification, and Validation of Diag. And PHM Systems: Procedures, Issues, and Experiences**

*Session Organizer: Andrew Hess, NAVAIR 4.4.2*

11.0101 Prognostics, from the Need to Reality from the Fleet Users and PHM System Designer/Developers Perspectives .....6-2791

11.0102 Verification of PHM Capabilities: a Joint Customer/Industrial Perspective .....6-2799

11.0103 Prognostic Enhancements to Diagnostic Systems for Improved Condition-Based Maintenance .....6-2815

11.0104 Development of Performance and Effectiveness Metrics for Gas Turbine Diagnostic Technologies .....6-2825

11.0105 Analysis of Space Shuttle Main Engine Data Using Beacon-based Exception Analysis for Multi-Missions .....6-2835

11.0106 An Approach for Conducting a Cost Benefit Analysis of Aircraft Engine Prognostics & Health Management Functions.....6-2847

#### **11.02 Wireless Applications for Diagnostics, Prognostics and Health Management**

*Session Organizer: G. William Nickerson, RLW, Inc.*

11.0201 Wireless LAN Technology for Engine Control and PHM .....6-2857

11.0202 The Slow Evolution of the Wireless Sensor.....6-2869

11.0203 Wireless Solutions for Aircraft Condition Based Maintenance Systems .....6-2877

#### **11.03 The Physics of Failures as Applied to Prognostics**

*Session Organizer: Leontios Christodoulou, DARPA/DSO*

11.0301 Microstructural Damage Metrics for Failure Physics .....6-2887

11.0302 Opto-Acoustical Sensor to Examine the Structural Integrity of Complex Systems .....6-2905

11.0303 Enhancement of Physics-of-Failure Prognostic Models with System Level Features .....6-2919

11.0304 Electrostatic Charge Generation Associated With Machinery Component Deterioration .....6-2927

## Table of Contents

### **11.04 Adv. Diagnostic, Prognostic and Health Management Technologies for Aerospace and Other Applications**

*Session Organizer: David Kleinman, Naval Postgraduate School*

11.0401 Integrating Model-Based Diagnostics with Simulation for Real Time Health Monitoring.....	6-2935
11.0402 Diagnosability Analysis for Distributed Systems.....	6-2943
11.0403 From Fault Trees to Diagnostics Knowledge Base: Case Study and Quantitative Improvement Assessment.....	6-2953
11.0404 F/A-18D(RC) Built-In-Test False Alarms .....	6-2961
11.0405 Reducing the No Fault Found Problem: Contributions from Expert-System Methods .....	6-2971
11.0406 The Information Content of Turbine Engine Data – A Chance for Recording-Based Life Usage Monitoring .....	6-2975
11.0407 Pathan A New Approach to Gas Turbine Diagnostics .....	6-2987

### **11.05 Fixed Wing and/or Rotary Wing Program Applications**

*Session Organizer: Andrew Hess, NAVAIR 4.4.2*

11.0501 Seeded Fault Testing in Support of Mechanical Systems Prognostic Development.....	6-2995
11.0502 Upgrading Engine Test Cells for Improved Troubleshooting and Diagnostics .....	6-3005
11.0503 Survivable Engine Control Algorithm Development (SECAD) .....	6-3015
11.0504 The Joint Strike Fighter (JSF) PHM Concept: Potential Impact on Aging Aircraft Problems .....	6-3021
11.0505 A Testbed for Data Fusion for Engine Diagnostics and Prognostics .....	6-3029
11.0506 Vibration Sensor Configuration Optimization for the AV-8B F402-RR-408 Engine.....	6-3043
11.0507 V22 Tiltrotor Aircraft Vibration Monitoring from Design to Field Operations .....	6-3051

### **11.06 Advanced Reasoner and Information Fusion Technologies**

*Session Organizer: Sue Morris, CENTRA Technology, Inc.*

11.0601 Health Management System Design: Development, Simulation and Cost/Benefit Optimization .....	6-3065
11.0602 Anomaly Detection and Reasoning with Embedded Physical Model.....	6-3073
11.0603 stic Diagnostic and Prognostic System for Gas Turbines (ProDAPS) .....	6-3083

### **11.07 Advanced Sensor Technologies**

*Session Organizer: Leo Fila, Naval Air Systems Command*

11.0701 Detection, Discrimination and Real-Time Tracking of Cracks in Rotating Detection, Discrimination and Real-Time Tracking of Cracks in Rotating Disks .....	6-3095
11.0702 Functional Evaluation of Robust Laser Interferometer (RLI) Developed Technology System Design Choices .....	6-3105
11.0703 Monitoring Blade Passage in Turbomachinery Through the Engine Case (NO Holes).....	6-3125
11.0704 Surface Roughness and Vibration Study of an Accelerometer Mount used in a Helicopter Health Usage and Management System .....	6-3131
11.0705 Surface Mounted and Scanning Periodic Field Eddy-Current Sensors for Structural Health Monitoring .....	6-3141

### **11.08 Prognostics and Health Management for Aging Aircraft**

*Session Organizer: Kevin Cavanaugh, Qualtech Systems, Inc.*

11.0801 PROMIS A Generic PHM Methodology Applied to Aircraft Subsystems .....	6-3153
11.0802 A Test Station Health Monitoring System .....	6-3161

## Table of Contents

### Volume 7

#### Track 12: Mission Operations Concepts and Technologies

*Track Organizer: Gary L. Spradlin, Jet Propulsion Laboratory, Caltech*

##### 12.01 Spacecraft Control and Management Technologies

*Session Organizer: Joseph Vellinga, Lockheed Martin Astronautics*

12.0101 Look, Ma, No HANS .....7-3169

##### 12.02 Space Operations Systems, Services, and Data Processing

*Session Organizer: Allen Bucher, Advanced Solutions, Inc*

12.0201 A Backroom Mission Operations Center for TechSat 21 .....7-3189

12.0202 Low Cost Ground Systems – Fantasy or Reality .....7-3195

##### 12.03 Observational Support Systems, Tools, and Technologies

*Session Organizer: Raymond Bamberg, Jet Propulsion Laboratory*

12.0301 Training of a Crater Detection Algorithm for Mars Crater Imagery .....7-3201

12.0302 A Multipropagator Approach to Real-Time Orbit Simulation .....7-3213

##### 12.04 Advanced Concepts for Mission Operations

*Session Organizer: Larry Lasher, NASA Ames Research Center*

*Session Organizer: Gary Spradlin, Jet Propulsion Laboratory*

12.0401 Operations Concept for TES Mission Operations .....7-3233

12.0402 Mars Mission Science Operations Facilities Design .....7-3245

12.0403 Relating Downlink Products to Uplink Commands in Mars Rover Operations .....7-3257

12.0404 Visualization of Spectroscopy for Remote Surface Operations .....7-3265

12.0405 Distributed Mission Operations with the Multi-mission Encrypted Communication System .....7-3273

12.0406 Link-Capability Driven Network Planning and Operation .....7-3281

12.0407 Applying the Lessons of Internet Services to Space Systems .....7-3287

##### 12.05 Human Factors – Selected Issues for Aerospace

*Session Organizer: Carol Scott, Jet Propulsion Laboratory*

*Session Organizer: Wolfgang Gottlieb, DaimlerChrysler AG*

12.0501 e-STARS A New View Into Information Management .....7-3297

12.0502 An Automated Chest Pain Diagnostic System for Distant Space Travel .....7-3311

12.0503 An Automated System for Distributing Literature and Managing Information Overload .....7-3321

##### 12.06 Use of Automation in Space Systems

*Session Organizer: Patrice Cappelaere, Interface & Control Systems*

*Session Organizer: Kimberly Simpson, Jet Propulsion Laboratory*

12.0601 Progressive Automation in Aerospace Systems .....7-3327

12.0602 QoS Tradeoffs for Guidance, Navigation, and Control .....7-3333

#### Track 13: Systems Engineering and Project Management

*Track Organizer: Charles Leising, Jet Propulsion Laboratory*

*Track Organizer: Todd J. Mosher, The Aerospace Corporation*

##### 13.01 Advanced Engineering Environments

*Session Organizer: John Baker, Jet Propulsion Laboratory*

13.0101 DSEDS – A High-Fidelity Dynamics and Spacecraft Simulator for Entry, Descent and Surface Landing .....7-3343

## Table of Contents

### **13.02 Design Optimization Tools, Methods, and Processes**

*Session Organizer: Todd Mosher, The Aerospace Corporation*

13.0201 Optimizing the Design of End-to-end Spacecraft Systems using Risk as a Currency .....	7-3361
13.0202 Dynamic Risk Assessment of CFD Codes .....	7-3369

### **13.03 Modeling, Simulation and Analysis**

*Session Organizer: Steve Fiedler, Air Force Research Lab (AFRL)*

13.0301 Small Satellite Thermal Modeling, Simulation, Analysis, and Design: US Air Force Academy FalconSat-2 Applications.....	7-3391
13.0302 Automated Data Processing and Cosmic Ray Mitigation of Up-the-Ramp Sampled Data .....	7-3401

### **13.04 Management Tools, Methods and Processes**

*Session Organizer: Randall Taylor, Jet Propulsion Laboratory*

13.0401 Flight Hardware Delivery Breakthroughs Via Engineering/Business Best-Practices Synthesis .....	7-3409
13.0402 Rapid Spacecraft Development: Results and Lessons Learned.....	7-3429
13.0403 The Impact of Small Businesses on Critical NASA Space Missions.....	7-3437
13.0404 Forming and Leading Powerful Teams.....	7-3449
13.0405 Distributed Teaming on JPL Projects .....	7-3461
13.0406 A Systems Management Approach to Improving Performance and Reducing Risks in Research Projects and Program ....	7-3467
13.0407 Managing Unmanned Flight Projects using Methods in Complex Product Development .....	7-3473
13.0408 Management Alternatives for the International Space Station .....	7-3491
13.0409 A Personnel/User Database Implementing EAR/ITAR-Compliant Access Controls to a Project Information System .....	7-3503

### **13.05 System Engineering Tools, Methods and Processes**

*Session Organizer: David Durham, Jet Propulsion Laboratory*

13.0501 Smoothing the Integration Path: Key Elements in the Design of Data Interfaces and Simulators .....	7-3511
13.0502 Relating Failure Prognostics to System Benefits.....	7-3521

## **Track 14: Government Plans and Policies**

*Track Organizer: Bob Profet, Profet Enterprises*

### **14.01 Gossamer Spacecraft Programs and Technology**

*Session Organizer: Melvin Montemerlo, NASA Headquarters*

### **14.02 Structure & Evolution of the Universe: The NASA Program**

*Session Organizer: Steven Horowitz, NASA Headquarters*

*Session Organizer: Timothy Koch, Jet Propulsion Laboratory*

14.0201 Status of CHIPS: A NASA University Explorer Astronomy Mission .....	7-3527
14.0202 Bolometric Detectors for the High Frequency Instrument on the Planck Surveyor .....	7-3535

### **14.03 Searching for the Origins of Life: Programs, Missions, and Technology**

*Session Organizer: Melvin Montemerlo, NASA Headquarters*

14.0301 The InterPlanetary Superhighway and the Origins Program .....	7-3543
14.0302 Innovative Quantum Technologies for Microgravity Fundamental Physics and Biological Research .....	7-3563

### **14.04 Astronaut Construction of Large Space Structures**

*Session Organizer: Rud Moe, NASA Goddard Space Flight Center*

14.0401 A History of Astronaut Construction of Large Space Structures at NASA Langley Research Center .....	7-3569
14.0402 Robotic Assembly of Truss Structures for Space Systems and Future Research Plans .....	7-3589
14.0403 EVA, Robotic, and Cooperative Assembly of Large Space Structures.....	7-3599
14.0404 Assembly and Servicing of a Large Telescope at the International Space Station.....	7-3611
14.0405 Applying Kinodynamic Randomized Motion Planning with a Dynamic Priority System to Multi-Robot Space Systems .....	7-3621
14.0406 Exploratory Motion Generation for Monocular Vision-Based Target Localization .....	7-3633
14.0407 Dialogue-Based Human-Robot Interaction for Space Construction Teams.....	7-3645



## Table of Contents

14.0408 A Method for Estimating Costs and Benefits of Space Assembly and Servicing by Astronauts and Robots .....	7-3655
14.0409 Review of Components for Large Spacecraft Implementation.....	7-3665
<b>14.05 Industry, Government, and University Partnerships and Outreach</b>	
<i>Session Organizer: William Dick, University of Illinois at Urbana-Champaign</i>	
14.0501 NASA's Commercial Space Centers: Bringing Together Government and Industry for Out of this World Benefits .....	7-3673
<b>14.06 Aerospace Education Projects &amp; Policies</b>	
<i>Session Organizer: Christopher Kitts, Santa Clara University</i>	
14.0601 To C Or to Java, That is the Question, Featuring a Test Plan and An Automated Testing Assistant for Object Oriented Testing.....	7-3679