TENTH ANNUAL

AIAA/UTAH STATE UNIVERSITY

CONFERENCE

on

SMALL SATELLITES

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General Chairman

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Conference Director

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Assistant Conference Director

UTAH STATE UNIVERSITY
LOGAN, UT  84322

September 16-19, 1996
Chair: Ark Lew, The Johns Hopkins University Applied Physics Laboratory

- **THE SPACE TECHNOLOGY RESEARCH VEHICLES: STRV-1A,B,C & D**
  R. Blott and N. Wells - Defence Research Agency, UK

- **MIGHTYSAT I: TECHNOLOGY IN SPACE FOR ABOUT A NICKEL ($M)**
  R.J. Davis - The Aerospace Corporation; J.F. Monahan - Phillips Laboratory; and T.J. Itchkawich - CTA Space Systems

- **THE SPACE TEST PROGRAM APEX MISSION - FLIGHT RESULTS** *
  F.L. Knight - The Aerospace Corporation

- **ORBCOMM SATELLITES LAUNCH AND INITIAL FLIGHT OPERATIONS**
  D.A. Steffy - Orbital Sciences Corporation

- **GPS BASED ATTITUDE DETERMINATION - THE REX II FLIGHT EXPERIENCE**
  D. Freesland, K. Reiss, D. Young, J. Cooper - CTA Space Systems; and A. Adams - USAF

- **THE NEAR DISCOVERY MISSION: LESSONS LEARNED**
  R.H. Maurer and A.G. Santo - The Johns Hopkins University Applied Physics Laboratory

* ABSTRACT PRINTED
TECHNICAL SESSION II
NEW MISSION CONCEPTS I
Tuesday, September 17, 1996
11:00 am - 12:30 pm

Chair: Lt. Col. Randy Liefer, U.S. Air Force Academy

- SAC-A SATELLITE *
  M. Machado, D. Caruso, E. Roggero, J. Bratina, R. Alonso, J. Vega, P. Anigstein
  and R.S. Peña - CoNAE, Argentina

- REVOLUTIONARY NEXT GENERATION SMALL SATELLITE
  COMMUNICATIONS MISSIONS AND ARCHITECTURES
  J.R. Stuart - Consultant

- THE MARS MICROPROBE MISSION: A UNIQUE SOLUTION FOR NETWORK
  SCIENCE *
  G.E. Powell and S.A. Gavit - Jet Propulsion Laboratory

- SMEX-LITE - NASA's NEXT GENERATION SMALL EXPLORER
  J.G. Watzin - NASA Goddard Space Flight Center

- KEY TECHNOLOGICAL SOLUTIONS TOWARDS THE SACI-1 MICROSATellite
  DESIGN
  J.A.C.F. Neri, S. Rabay, W.A. Dos Santos, P.N. De Souza, I.M. Fonseca and
  A.R. De Paula Jr. - National Space Research Institute (INPE), Brazil

- PICOSAT FREE FLYING MAGNETOMETER EXPERIMENT
  D.S. Clarke, M.T. Hicks, A.M. Fitzgerald, J.J. Suchman, R. Twiggs, T.W. Kenny -
  Stanford University; and J. Randolf - Jet Propulsion Laboratory

* ABSTRACT PRINTED
TECHNICAL SESSION III
SUBSYSTEMS & COMPONENTS I
Tuesday, September 17, 1996
1:30 pm - 3:00 pm

Chair: Wallace Fowler, University of Texas at Austin

- ON-ORBIT NiH\textsubscript{2} BATTERY PERFORMANCE AND PROBLEM SOLVING ON THE APEX SPACECRAFT
  M.A. Machlis - Orbital Sciences Corporation

- ANALYSIS AND DESIGN OF A NEW ALTERNATIVE FOR SATELLITE PLATFORMS
  E. Roggero, M. Cerocchi, A. Rauschert, and M. Sepúlveda - Universidad Tecnológica Nacional, Argentina

- PULSED PLASMA THRUSTER SYSTEMS FOR SPACECRAFT ATTITUDE CONTROL

- DESIGN AND CONSTRUCTION OF A ONE-PIECE MULTIFUNCTIONAL SMALL SATELLITE BUS STRUCTURE
  H.L. McManus, C.T. Dunn - Massachusetts Institute of Technology; and M. Socha - Draper Laboratory, Inc.

- CATSAT STRUCTURAL DESIGN
  C. Wood, B. McKinnon, D. Nelson - Weber State University; and D. Forrest - University of New Hampshire

- STRUCTURAL DESIGN OF THE BRAZILIAN SCIENTIFIC APPLICATIONS SATELLITE 1 (SACI-1)
  P.N. De Souza, W.K. Takahashi, M. Kataoka Filho, M.S. Ribeiro, S.E.C. Varotto and J.A.C.F. Neri - National Space Research Institute (INPE), Brazil

- POWERING SMALL SATELLITES WITH ADVANCED NiH\textsubscript{2} DEPENDENT PRESSURE VESSEL (DPV) BATTERIES
  D.B. Caldwell, C.L. Fox and L.E. Miller - Eagle-Picher Industries, Inc.
TECHNICAL SESSION IV
BETTER, CHEAPER, FASTER
Tuesday, September 17, 1996
3:30 pm - 5:00 pm

Chair: Terry Higbee, Computing Devices International

- WHAT'S THE PRICE OF LOW COST?
  J.R. Wertz and S. Dawson - Microcosm, Inc.

- A SIMPLIFIED USE OF QUALITY FUNCTION DEPLOYMENT AS A SYSTEM TOOL FOR DESIGNING TO COST
  S.V. Deal - TRW; and V. Coverstone-Carroll - University of Illinois

- PARAMETRIC DESIGN CURVES FOR PAYLOAD POWER & MASS CAPABILITIES OF NON-GEO SMALLSATS BUSES/LAUNCHERS
  G. Richardson - Spar Aerospace Limited; N. Sultan and A. Ng - Canadian Space Agency

- COMPARISON OF NEAR COSTS WITH A SMALL-SPACECRAFT COST MODEL *

- STREAMLINING COSTS AND INCREASING FISCAL ACCOUNTABILITY - AN INTEGRATED APPROACH TO FINANCIAL COST TRACKING AND REPORTING ON RAPID DEVELOPMENT SATELLITE PROJECTS *
  R. Ryan and J. Fiora - NASA Goddard Space Flight Center

- A NON-STANDARD PRODUCTION APPROACH TO SATELLITE CONSTELLATIONS
  J. Brunschwyler, K. Kelly and K. Kubota - Orbital Sciences Corporation

* ABSTRACT PRINTED
TECHNICAL SESSION V
NEW MISSION CONCEPTS II
Wednesday, September 18, 1996
8:30 am - 10:00 am

Chair: Jim Jacoby, CTA Space Systems

• SPARTAN LITE STATUS REPORT
  S.C. Meyers - NASA Goddard Space Flight Center

• A GEOMAGNETIC SMALLSAT OBSERVATORY FOR OPERATION IN A 200 KM ALTITUDE LOW EARTH ORBIT
  W.R. Baron, K.S. Schultz and P.L. Thomsen - Computer Resources International A/S, Denmark

• THE CATSAT STUDENT EXPLORER MISSION *
  D.J. Forrest, K. Levenson, W.T. Vestrand - University of New Hampshire;
  K. Reister, J. Smith, C. Wood, C. Williams - Weber State University;
  C. Whitford, D. Watson and A. Owens - University of Leicester, UK

• PRE-FLIGHT PERFORMANCE OF SUNSAT, SOUTH AFRICA'S FIRST REMOTE SENSING AND PACKET COMMUNICATIONS MICROSATELLITE
  A. Schoonwinkel, G.W. Milne, S. Mostert, W.H. Steyn and K. van der Westhuizen - Stellenbosch University, South Africa

• INTEGRATED REENTRY AND PENETRATOR VEHICLE (IRPV) FOR SUBSURFACE SOIL COLLECTION AND ANALYSIS ON MARS
  D.L. Keese and R.G. Lundgren - Sandia National Laboratories

• A LOW-COST WIRELESS POWER TRANSMISSION EXPERIMENT
  S.V. Deal - TRW; and V. Coverstone-Carroll - University of Illinois

* ABSTRACT PRINTED
TECHNICAL SESSION VI
MISSION OPERATIONS
Wednesday, September 18, 1996
10:30 am - 12:00 pm

Chair: Elaine Hansen, University of Colorado at Boulder

- OPERATIONS CONCEPTS FOR SMALL SATELLITES - RESULTS OF A WORKSHOP
  E. Rabenau, H. Fischer - Satellite Operational Services GmbH; and W. Klein - German Space Agency (DARA)

- A FULLY IMPLEMENTED SEMI-AUTOMATED GROUND-CONTROL SYSTEM FOR THE TERRIERS SATELLITE

- AUTOMATING THE OPERATIONS OF THE ORBCOMM CONSTELLATION
  J. Tandler - ORBCOMM Global

- TRADEOFFS IN FUNCTIONAL ALLOCATION BETWEEN SPACECRAFT AUTONOMY AND GROUND OPERATIONS: THE NEAR (NEAR EARTH ASTEROID RENDEZVOUS) EXPERIENCE

- FLEXIBILITY OF MISSION PLANNING TO CHANGING SPACECRAFT AND MISSION REQUIREMENTS FOR MSTI-3 OPERATIONS *
  R. Espiritu and M. Weldy - ANSER

- NEAR MISSION OPERATIONS: DEMONSTRATED STRENGTHS AND WEAKNESSES OF A “FASTER, BETTER, CHEAPER” PROGRAM *

* ABSTRACT PRINTED
TECHNICAL SESSION VII
UNIVERSITY STUDENT COMPETITION**
Wednesday, September 18, 1996
1:15 pm - 3:15 pm

Chairs:  Jayne Schnaars, Rockwell International
Robert H. Meurer, Orbital Sciences Corporation

• A BEACON MONITORING SYSTEM FOR AUTOMATED FAULT MANAGEMENT OPERATIONS
  Michael A. Swartwout and Christopher A. Kitts - Stanford University

• ADVANCES IN THERMAL CONTROL TECHNOLOGIES FOR SMALL SATELLITE SYSTEMS
  Scott M. Jensen - Utah State University

• DESIGN OF A LOW-COST SINGLE-BOARD COMPUTER SYSTEM FOR USE IN LOW-EARTH ORBIT SMALL SATELLITE MISSIONS
  Dino Milani - University of New Hampshire

• EOR: A UNIVERSITY SMALL SATELLITE FOR LOW COST REMOTE SENSING OF OZONE
  Ellen Riddle - University of Colorado at Boulder

• MODIFYING OFF-THE-SHELF, LOW COST, TERRESTRIAL TRANSCEIVERS FOR SPACE BASED APPLICATIONS
  Rick Lu - Stanford University

• THE DATA-CHASER HITCHHIKER PROJECT AS A DEMONSTRATION OF DISTRIBUTED OPERATIONS FOR SMALL SATELLITES
  Ryan W. Shepperd and Jason R. Willis - University of Colorado at Boulder

• THE DESIGN OF THE OPAL ATTITUDE CONTROL SYSTEM
  Jaewoo Jung, Naoki Kuzuya and Jaime Alvarez - Stanford University

• ASUSat 1 COMMUNICATIONS *
  Laura A. Knauth - Arizona State University

* ALTERNATE
** Not in order of presentation.
Chair: David Buhaly, Thiokol Corporation

- RESULTS OF LOW-COST ELECTRIC PROPULSION SYSTEM RESEARCH FOR SMALL SATELLITE APPLICATION
  T.J. Lawrence, J.J. Sellers - United State Air Force; J.W. Ward - University of Surrey; and M. Paul - Surrey Satellite Technology Ltd., UK

- ADVANCED PULSED PLASMA THRUSTER DEMONSTRATION ON MIGHTYSAT FLIGHT II.1

- SMALLSAT LAUNCH OPTIONS: CHOICES AND CHALLENGES
  M.A. Bille and E. Lishock - ANSER

- ANALYSIS OF THRUSTER REQUIREMENTS AND CAPABILITIES FOR LOCAL SATELLITE CLUSTERS
  G.J. Yashko and D.E. Hastings - Massachusetts Institute of Technology

- COST EFFECTIVE ACCESS TO SPACE *
  J.M. Palsulich - McDonnell Douglas Aerospace

- STATUS OF THE SCORPIUS LOW COST LAUNCH SERVICES PROGRAM

* ABSTRACT PRINTED
• REPORT ON ALTERNATIVE DEVICES TO PYROTECHNICS ON SPACECRAFT
  M. Lucy, R. Hardy, E. Kist, J. Watson and S. Wise - NASA Langley Research Center

• A RADIATION-HARDENED COMPUTER FOR SATELLITE APPLICATIONS
  J.I. Gaona, Jr. - Sandia National Laboratories

• GPS NAVIGATION FOR USE IN ORBITS HIGHER THAN SEMISYNCHRONOUS:
  A LOOK AT THE POSSIBILITIES AND A PROPOSED FLIGHT EXPERIMENT
  M.D. Lester - University of Colorado

• A SMALL RE-ENTRY CAPSULE - BREM-SAT 2
  M. Wiegand - University of Bremen, Germany; and H.J. Königsmann -
  Microcosm, Inc.

• THE NEAR GROUND SYSTEM: EFFICIENT MISSION COMMAND AND
  CONTROL
  G. Whitworth - The Johns Hopkins University Applied Physics Laboratory;
  A. Somers - Alexis Logic Corporation; and W.C. Stratton - Integral Systems, Inc.

• INTEGRATED MODULAR PROPULSION AND REGENERATIVE ELECTRO-
  ENERGY STORAGE SYSTEM (IMPRESS) FOR SMALL SATELLITES *

* ABSTRACT PRINTED
TECHNICAL SESSION X
ATTITUDE DETERMINATION & CONTROL
Thursday, September 19, 1996
9:30 am - 10:15 am & 10:30 am - 11:15 am

Chair: Rees Fullmer, Utah State University

- LOW-COST ATTITUDE DETERMINATION AND CONTROL FOR SMALL SATELLITES
  J.L. Smith, C. Wood, K. Reister - Weber State University; D.J. Forrest, K. Levenson, W.T. Vestrard - University of New Hampshire; C. Whitford, D. Watson and A. Owens - University of Leicester, UK

- A NEW ATTITUDE CONTROL MECHANISM FOR LEO SATELLITES
  M.R. Krebs - Orbital Sciences Corporation

- LOCAL VERTICAL/LOCAL HORIZONTAL ATTITUDE CONTROL FOR SPARTAN SPACECRAFT
  J.R. Morrissey - CTA, Inc.; and D.J. Olney - NASA Goddard Space Flight Center

- AUTONOMOUS CONSTELLATION MAINTENANCE SYSTEM

- THE SSTI LEWIS BETTER, FASTER, AND CHEAPER GUIDANCE, NAVIGATION, AND CONTROL SUBSYSTEM
  P. Parry - TRW

- ON-BOARD AUTONOMY FOR A LOW COST LUNAR MISSION
  N.D. Monekosso - Surrey Satellite Technology Ltd, UK
TECHNICAL SESSION XI
COMMUNICATIONS
Thursday, September 19, 1996
12:30 pm - 2:00 pm

Chair: Linda Allen, Space Dynamics Laboratory

- CONCEPTS FOR THE VIRTUAL SATELLITE COMMAND AND CONTROL NETWORK *
  J. Brady - Raytheon E-Systems

- NOVEL COLLAPSIBLE LENS ANTENNA DESIGN FOR SMALLSAT APPLICATIONS *
  N. Sultan, G. Seguin - Canadian Space Agency; and P.J. Wood - CAL Corporation

- PROGRESS OF THE DEVELOPMENT OF WHALE ECOLOGY OBSERVATION SATELLITE SYSTEM
  T. Hayashi - Chiba Institute of Technology; H. Tomita - Adachi, Tokyo, Japan

- COMMAND AND DATA HANDLING PROCESSOR
  J.A. Perschy - The Johns Hopkins University Applied Physics Laboratory

- MARS SURVEYOR PROGRAM AND UHF TELEMETRY COMMUNICATIONS *
  S. Toro-Allen - Lockheed Martin Astronautics; and C. Anderson - Cincinnati Electronics Corporation

- STREAMLINING SATELLITE DEVELOPMENT, TESTING, AND OPERATIONS USING A COTS COMMAND AND TELEMETRY PACKAGE
  A.W. Lewin - Orbital Sciences Corporation

* ABSTRACT PRINTED
TECHNICAL SESSION XII
INSTRUMENTS AND SENSORS
Thursday, September 19, 1996
2:00 pm - 3:30 pm

Chair: Hans Königsmann, Microcosm, Inc.

- PYRAMID COARSE SUN SENSING FOR NASA SSTI "CLARK" SAFE-HOLD MODE
  J. Benton - CTA Space Systems

- A MICROMECHANICAL GYRO PACKAGE WITH GPS UNDER DEVELOPMENT FOR SMALL POINTING SATELLITES
  N. Barbour, P. Madden and M. Socha - Draper Laboratory, Inc.

- ATTITUDE DETERMINATION AND LAUNCH DIAGNOSTICS FOR A PICOSAT VIA KALMAN FILTERING OF MAGNETOMETER DATA *
  P. Graven, J. Jung, T. Kenny and R. Twiggs - Stanford University

- A MEO-GEO COMBINED EARTH SENSOR/SUN SENSOR *
  J.J. Fallon and G. Falbel - Space Sciences Corporation

- OPTICAL DESIGN AND PERFORMANCE OF THE ODIN UV/VISIBLE SPECTROGRAPH AND INFRARED IMAGER INSTRUMENT
  G. Warshaw, D. Desaulniers - Routes Incorporated; and D. Degenstein - University of Saskatchewan, Canada

- LABORATORY(AND ON-ORBIT) MAGNETOMETER CALIBRATION WITHOUT A COIL FACILITY OR ORIENTATION INFORMATION
  P. Graven and T. Kenny - Stanford University
POSTER SESSION

- A COMBINED ATTITUDE CONTROL REACTION WHEEL/MECHANICAL BATTERY USING SEMI-PASSIVE MAGNETIC BEARINGS
  G. Falbel - Space Sciences Corporation

- A MULTI-CHANNEL DIRECT CONVERSION DIGITAL UPLINK RECEIVER
  R. Huebner, N. Pappageorge, L. Atkinson - Orbital Sciences Corporation; T. Seay, E. Odeen, R. Manherz and S. Golden - Torrey Science Corporation

- CONSTRUCT-O-SAT SMALL SATELLITE STRUCTURAL ARCHITECTURAL SYSTEM
  P. Carter - Lawrence Livermore National Laboratory; J. Eisenreich and C. Simmons - United State Air Force Academy

- CREATING SMALL SATELLITE CONSTELLATIONS AROUND THE SUN
  C. McLain, M. Martinez-Sanchez and G.R. Ricker - Massachusetts Institute of Technology

- DESIGN AND DEVELOPMENT OF A PRECISION POINTING MICROSAT FOR A VISIBLE IMAGING MISSION
  M. Socha, G. Capiello, P. Madden, R. Metzinger, D. Nokes, C. Tung - Draper Laboratory; and H. McManus - Massachusetts Institute of Technology

- DESIGN OF THE PASSIVE AERODYNAMICALLY STABILIZED MAGNETICALLY DAMPED SATELLITE (PAMS) SATELLITE TEST UNIT (STU)
  G.W. Durback, C. Tooley and T. Wallace - NASA Goddard Space Flight Center

- FLIGHT RESULTS OF THE UPM-SAT 1
  A. Sanz-Andrés, E. González-Folgar, J. Santiago-Prowald, J. Pérez-Grande, A. Ayuso, C. Gutíérrez & C. Terréz - Polytech University of Madrid, Spain

- HIGH DATA RATE X-BAND COMMUNICATIONS SUBSYSTEM
  M. Dapore - Cincinnati Electronics Corporation

- MICROLAB 1 MISSION
  H. Alexander - Orbital Sciences Corporation

- MICROPROCESSOR TECHNOLOGY AND SINGLE EVENT UPSET SUSCEPTIBILITY
  L.D. Akers - Univeristy of Colorado

- MULTI-IMPULSE RENDEZVOUS MANEUVERS OF TWO SPACECRAFT IN A CIRCULAR ORBIT
  G.G. Raikunov and V.I. Loukiaschenko - Central Research Institute of Machine Building, Russia
• NEAR COSTING AS A TEMPLATE FOR FUTURE SMALL SPACECRAFT MISSIONS
  J.T. Hemmings - The Johns Hopkins University Applied Physics Laboratory

• NEXT-GENERATION ELECTRIC PROPULSION SYSTEMS FOR SMALL SATELLITES

• ON-ORBIT RESCUE AND REPROGRAMMING OF THE STEP MISSION 0 SPACE VEHICLE
  J.S. Sutila - TRW

• OPAL STUDENT SATELLITE PROJECT
  C. García-Sacristán and C. Tillier - Stanford University

• PHASE 3D: A NEW ERA FOR AMATEUR RADIO SATELLITES
  R.L. Daniels - Amateur Radio Satellite Corporation (AMSAT)

• PROGRAM MANAGEMENT AND DESIGN FOR CONCURRENT SATELLITE DEVELOPMENT USING COLLABORATIVE TECHNOLOGIES
  R. Fruchter, K. Reiner, G. Toye, L. Liefer, S. Yen, R. Twiggs - Stanford University;
  J. George and J. Peterson - Jet Propulsion Laboratory

• SILA, A CANADIAN UNIVERSITY SATELLITE PROJECT
  M. Bullock and D.A. Staley - Carleton University

• THE FINAL ANALYSIS DATA COLLECTION CONSTELLATION
  M. Ahan, N. Modanlo and R. Megill - Final Analysis Incorporated

• THE PAYLOAD MODULE (PLM) OF THE MINISAT 01 MISSION
  J. Torres, R. Alfageme, E. Herrera, M Fernandez, J.A. Romera, C. Pérez, M. Reina, J.A. Martin, A. Sanchez and R. Beiztegui - INTA, Spain

• UNIVERSAL PLATFORM FOR SMALL SPACE APPARATUS

• USING ATMOSPHERIC DRAG FOR CONSTELLATION CONTROL OF LOW EARTH ORBIT MICRO-SATELLITES
  D.N.J. du Toit, J.J. du Plessis and W.H. Steyn - University of Stellenbosch, South Africa

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