



GUIDANCE AND CONTROL 1993

Volume 81 ADVANCES IN THE ASTRONAUTICAL SCIENCES

**Edited by
Robert D. Culp
George Bickley**

*Proceedings of the Annual Rocky Mountain
Guidance and Control Conference held
February 6-10, 1993, Keystone, Colorado.*

*Published for the American Astronautical Society by
Univelt, Incorporated, P.O. Box 28130, San Diego, California 92198*

CONTENTS

	Page
FOREWORD, Robert D. Culp	vii
PREFACE, George Bickley	xi
SECTION I - ADVANCES IN GUIDANCE, NAVIGATION AND CONTROL	1
Application of Fuzzy Logic to Optimize Placement of an Acquisition, Tracking, and Pointing Experiment (AAS 93-011) Jerry Bukley	3
The Coherent Launchsite Wind Sounder (CLAWS) (AAS 93-012) Douglas B. Price	13
A Low Cost Ultraviolet Solid State Sensor System for the Three Axis Attitude Determination (AAS 93-013) James Billing-Ross, Teresa Fritz, Douglas Pledger, Ralph Castain, William Saylor	25
Results from the Middeck 0-Gravity Dynamics Experiment (AAS 93-014) M. C. van Schoor, E. F. Crawley, D. W. Miller	33
Application of Flight Data to Space Shuttle CCD Star Tracker Catalog Design (AAS 93-015) Karen Barry, Mark Hindman, Russell Yates	57
Control of the Magellan Spacecraft During Aerobraking (AAS 93-016) Anita S. Carpenter	71
Translation, Rotation, and Vibration Control of Large Space Structures Using Self-Differential GPS (SDGPS) (AAS 93-017) Harris Teague, Bradford W. Parkinson	93
SECTION II - CONTROL SYSTEM VIDEOS	103
Research in Free-Flying Robots and Flexible Manipulators at the Stanford Aerospace Robotics Laboratory (AAS 93-021) W. L. Ballhaus, L. J. Alder, V. W. Chen, W. C. Dickson, M. A. Ullman, E. Wilson	105

	Page
Telerobot Local-Remote Control Architecture for Space Flight Program Applications (AAS 93-022) Wayne Zimmerman, Paul Backes, Robert Steele, Mark Long, Bruce Bon, John Beahan	125
Determination of the Mass Properties of a Manipulator (AAS 93-023) Stewart Goldenberg, Jim Lowrie, Wallace Harrison	139
Neutral Buoyancy Simulation of Space Telerobotics Operations (AAS 93-024) P. Churchill, D. Akin, R. Howard	149
Multidisciplinary Analysis of Segmented Reflector Telescopes (AAS 93-026) Laura Needels, Hugh C. Briggs	151
Captive Flight Testing of a Kinetic Kill Vehicle (AAS 93-027) R. H. Worrell, M. A. Summers, V. P. Brugman, L. F. Weaver, J. R. Etter, B. J. Patz, Y. V. Ruiz	159
SECTION III - GN&C EMBEDDED FLIGHT CONTROL SYSTEMS	177
Low Cost Spacecraft Computers: Oxymoron or Future Trend? (AAS 93-031) Robert M. Manning	179
ISO on-Board Software (AAS 93-032) J. Busseuil, P. Guyot, S. Mejnertsen	193
The Cassini Spacecraft: Object Oriented Flight Control Software (AAS 93-033) John C. Hackney, Douglas E. Bernard, Robert D. Rasmussen	211
Development of a Flight Software Prototype Using a Series 32000 Microprocessor (AAS 93-034) Mark J. Schaffman	237
Spacecraft Fault Tolerance: The Magellan Experience (AAS 93-035) Rick Kasuda, Donna Sexton Packard	249
EOS-AM Precision Pointing Verification (AAS 93-036) A. Throckmorton, E. Braknis, J. Bolek	269
Describing an Attitude (AAS 93-037) D. I Kolve	289
SECTION IV - RECENT EXPERIENCES	305
Solar Anomalous and Magnetospheric Particle Explorer Attitude Control Electronics Box Design and Performance (AAS 93-041) K. Chamberlin, C. Clagett, T. Correll, T. Gruner, T. Quinn, L. Shiflett, R. Schnurr, M. Wennersten, M. Frederick, S. M. Fox	307

Tether Dynamics and Control Results for Tethered Satellite System's Initial Flight (AAS 93-042)	
Jim D. Chapel, Howard Flanders	327
Galileo: Challenges Enroute to Jupiter (AAS 93-043)	
William J. O'Neil	347
Living with on-Orbit Anomalies in the TOPEX/POSEIDON Earth Sensors (AAS 93-044)	
Charles J. Gay, Raymond V. Welch, Vaughn H. Selby	361
Magellan Attitude Control Mission Operations (AAS 93-045)	
Eileen M. Dukes	375
Field Test Results for a CID Star Tracker (AAS 93-046)	
Bernard Kaufman, Robert Dasenbrock, Alan Hope, Henry Pickard, Peter Melvin, Morton Frank, Steven F. McLaughlin	389
Initial Flight Performance of the Mars Observer Spacecraft (AAS 93-047)	
T. G. Tracy	409
SECTION V - GUIDANCE AND CONTROL	
STORYBOARD DISPLAYS	421
The Application of Fuzzy Logic Control to the IntelliSTAR™ Architecture (AAS 93-052)	
John M. Barry, Thomas P. Gathmann	423
C-Side: Control-Structure Integration Demonstration Experiment (AAS 93-064)	
James B. Mohl, Hugh W. Davis	431
Hubble Space Telescope EVA Multisetting Torque Limiter Redesign (AAS 93-053) Abstract	
Paul W. Richards, Mike Garrah	447
Space IRU's of Diverse Technologies and Performance (AAS 93-054) Abstract	
Clifford O. Swanson, Shri A. Kumar	448
Miniature Angle Measuring Interferometer (MIAMI) (AAS 93-055) Abstract	
Robert J. Bauer	449
Dynamic Scene Projection for Testing of Seeker Systems That Sense in the UV, Visible, or IR (AAS 93-058) Abstract	
Ludwig G. Wolfert, Scot K. Anderson	450
Microradian Level Inertial Line-of-Sight (ILOS) Stabilization with Wide-Angle Search (WAS) Capability (AAS 93-060) Abstract	
Avanindra A. Gupta, Lawrence M. Germann	451

	Page
A Versatile 50 Ft-Lb-Sec Reaction Wheel for TRMM and XTE Missions (AAS 93-061) Abstract Bill Bialke	452
Hubble Space Telescope EVA Power Ratchet Tool Redesign (AAS 93-063) Abstract Paul W. Richards, Chan Park, Lee Brown	453
A Multiaxis Passive Isolation System for a Magnetic Bearing Reaction Wheel (AAS 93-066) Abstract D. Cunningham, P. Davis	454
A New Guidance and Flight Control System for the Delta II Launch Vehicle (AAS 93-068) Abstract R. Pordon, K. Tompetrini, S. Weinstein, H. Dhuyvetter	455
An Attitude Control System for the Wake Shield Facility (AAS 93-071) Abstract V. Selby, B. Tobey, S. Fox, P. Pal, S. Fujikawa, S. Hill	456
Electromechanical Actuator (AMA) Rocket Motor Controller (AAS 93-072) Abstract Zygmunt Zubkow	457
SECTION VI - APPLICATIONS OF MODERN CONTROL: HUBBLE SPACE TELESCOPE (HST) PERFORMANCE ENHANCEMENT STUDY	459
Hubble Space Telescope Pointing Control System Design Improvement Study (AAS 93-001) Angelia P. Bukley	461
Current NASA HST Controller Design and Performance (AAS 93-002) Gerald S. Nurre, John D. Nelson, Arthur J. Bradley	467
H-Infinity Control Design Specifications Applied to the Hubble Space Telescope (AAS 93-003) R. Dennis Irwin, Douglas A. Lawrence, Russell D. Glenn, W. Garth Frazier	493
Covariance Control Design for the HST (AAS 93-004) Guoming Zhu, Karolos M. Grigoriadis, Robert E. Skelton	519
LQG and Maximum Entropy Control Design for the Hubble Space Telescope (AAS 93-005) Emmanuel G. Collins, Jr., Stephen Richter	539
Hubble, Bubble, Toil and Trouble: A Reduced-Order Model Based SAGA of the Hubble Space Telescope (AAS 93-006) Mark Balas, L. R. Robertson, Yung Jae Lee, James Mohl, Rebecca Garzella	553

	Page
A Dual-Mode Disturbance-Accommodating Controller for the Hubble Space Telescope (AAS 93-007) Stewart Addington, C. D. Johnson	575
APPENDICES	607
Publications of the American Astronautical Society	608
Advances in the Astronautical Sciences	609
Science and Technology Series	615
AAS History Series	620
INDEX	621
Numerical Index	623
Author Index	627