

## CONTENTS

	Page
<b>KEYNOTE ADDRESS</b>	
Dell P. Williams III . . . . .	1
<b>SESSION 1 - MATERIAL RESPONSES</b>	
DIELECTRIC DISCHARGE CHARACTERISTICS IN A TWO-ELECTRON SIMULATION ENVIRONMENT	
M. Treadaway, R. Leadon, C. Mallon, T. Flanagan, R. Denson, and E. Wenaas . . . . .	4
ELECTRON-BEAM-CHARGED DIELECTRICS - INTERNAL CHARGE DISTRIBUTION	
Brian L. Beers and V. W. Pine. . . . .	17
BULK CHARGING AND BREAKDOWN IN ELECTRON-IRRADIATED POLYMERS	
A. R. Frederickson . . . . .	33
CHARGING AND DISCHARGING TEFLON	
B. C. Passenheimp and V. A. J. van Lint . . . . .	52
EXPERIMENTAL VALIDATION OF A NUMERICAL MODEL PREDICTING THE CHARGING CHARACTERISTICS OF TEFLON AND KAPTON UNDER ELECTRON BEAM IRRADIATION	
R. C. Hazelton, E. J. Yadlowsky, R. J. Churchill, L. W. Parker, and B. Sellers . . . . .	65
ROLE OF ENERGETIC PARTICLES IN CHARGING/DISCHARGING OF SPACECRAFT DIELECTRICS	
J. B. Reagan, R. W. Nightingale, E. E. Gaines, R. E. Meyerott, and W. L. Imhof. . . . .	74
ELECTRON PENETRATION OF SPACECRAFT THERMAL INSULATION	
Walter L. Powers, Barbara F. Adams, and George T. Inouye . . . . .	86
ELECTROSTATIC DISCHARGING BEHAVIOUR OF KAPTON IRRADIATED WITH ELECTRONS	
Derek Verdin . . . . .	96
DIELECTRIC SURFACE DISCHARGES: EFFECTS OF COMBINED LOW-ENERGY AND HIGH-ENERGY INCIDENT ELECTRONS	
K. G. Balmain and W. Hirt. . . . .	115
PRELIMINARY COMPARISON OF MATERIAL CHARGING PROPERTIES USING SINGLE- ENERGY AND MULTIENERGY ELECTRON BEAMS	
R. C. Adamo and J. E. Nanevicz . . . . .	129
BRUSHFIRE ARC DISCHARGE MODEL	
G. T. Inouye . . . . .	133

SESSION 2 - MATERIAL CHARACTERIZATION

EFFECTS OF SECONDARY ELECTRON EMISSION ON CHARGING Martin S. Leung, Michael B. Tueling, and Edwin R. Schnauss . . . . .	163
SECONDARY ELECTRON EMISSION YIELDS I. Krainsky, W. Lundin, W. L. Gordon, and R. W. Hoffman . . . . .	179
OBLIQUE-INCIDENCE SECONDARY EMISSION FROM CHARGED DIELECTRICS James W. Robinson and Paul A. Budd . . . . .	198
TANK TESTING OF A 2500-cm <sup>2</sup> SOLAR PANEL Renate S. Bever and John Staskus . . . . .	211
CHARGING AND DISCHARGING CHARACTERISTICS OF A RIGID SOLAR ARRAY George F. Brady, Jr., David A. Vance, and Stanley A. Greenberg . . . . .	228
MATERIALS CHARACTERIZATION STUDY OF CONDUCTIVE FLEXIBLE SECOND SURFACE MIRRORS F. Levadou, S. J. Bosma, and A. Paillous . . . . .	237
DESIGN OF AN ARC-FREE THERMAL BLANKET Christakis N. Fellas . . . . .	261
CHARGING CONTROL TECHNIQUES R. E. Schmidt . . . . .	267
CHARGING CHARACTERISTICS OF SILICA FABRICS Léon Levy and Alain Paillous . . . . .	287
ELECTROSTATIC CHARGING CHARACTERISTICS OF THERMAL CONTROL PAINTS AS FUNCTION OF TEMPERATURE Paul A. Robinson, Jr., and A. C. Whittlesey . . . . .	309
EVALUATION OF CHARGE CONTROL TECHNIQUES ON SPACECRAFT THERMAL SURFACES (ELECTROSTATIC DISCHARGE STUDY) P. A. Robinson, Jr., E. M. Brown, S. M. Conan, C. R. Dulgeroff, W. R. Elkman, G. J. Holm, L. C. Lawton, G. J. Pack, and D. L. Shannon . . . . .	320
CONDUCTION THROUGH PUNCTURES IN METAL-BACKED DIELECTRICS A. Meulenberg and P. A. Robinson, Jr. . . . .	342
ACCELERATED ALPHA-S DETERIORATION IN A GEOSTATIONARY ORBIT Otto K. Husmann . . . . .	353
SESSION 3 - SCATHA FLIGHT DATA	
OPERATIONAL STATUS OF THE SPACE TEST PROGRAM P78-2 SPACECRAFT AND PAYLOADS 1Lt. Richard N. Osgood . . . . .	365

ELECTRON ANGULAR DISTRIBUTIONS DURING CHARGING EVENTS J. F. Fennell, D. R. Croley, Jr., P. F. Mizera, and J. D. Richardson . . . . .	370
OPERATION OF SC5 RAPID SCAN PARTICLE SPECTROMETER ON SCATHA SATELLITE Frederick A. Hanser, Bach Sellers, David A. Hardy, H. A. Cohen, J. Feynman, and M. S. Gussenhoven. . . . .	386
REVIEW OF HOT PLASMA COMPOSITION NEAR GEOSYNCHRONOUS ALTITUDE Richard G. Johnson . . . . .	412
SCATHA OBSERVATIONS OF SPACE PLASMA COMPOSITION DURING A SPACECRAFT CHARGING EVENT R. G. Johnson, R. Strangeway, S. Kaye, R. Sharp, and E. Shelley. . . .	433
P78-2 ENGINEERING OVERVIEW A. L. Vampola. . . . .	439
SATELLITE SURFACE POTENTIAL SURVEY Paul F. Mizera and G. M. Boyd. . . . .	461
PRELIMINARY ANALYSIS OF DATA FROM SRI INTERNATIONAL TRANSIENT PULSE MONITOR ON BOARD P78-2 SCATHA SATELLITE S. A. Damron, R. C. Adamo, and J. E. Nanevicz. . . . .	470
ASPECT DEPENDENCE AND FREQUENCY SPECTRUM OF ELECTRICAL DISCHARGES ON THE P78-2 (SCATHA) SATELLITE Harry C. Koons . . . . .	478
FLIGHT EVIDENCE OF SPACECRAFT SURFACE CONTAMINATION RATE ENHANCEMENT BY SPACECRAFT CHARGING OBTAINED WITH A QUARTZ CRYSTAL MICROBALANCE D. M. Clark and David F. Hall. . . . .	493
P78-2 SATELLITE AND PAYLOAD RESPONSES TO ELECTRON BEAM OPERATIONS ON MARCH 30, 1979 H. A. Cohen, R. C. Adamo, T. Aggson, A. L. Chesley, D. M. Clark, S. A. Damron, D. E. Delorey, J. F. Fennell, M. S. Gussenhoven, F. A. Hanser, D. Hall, D. A. Hardy, W. B. Huber, I. Katz, H. C. Koons, S. T. Lai, B. Ledley, P. F. Mizera, E. G. Mullen, J. E. Nanevicz, R. C. Olsen, A. G. Rubin, G. W. Schnuelle, N. A. Saflekos, M. F. Tautz, and E. C. Whipple. . . . .	509
SESSION 4 - ANALYTICAL MODELING	
REPRESENTATION AND MATERIAL CHARGING RESPONSE OF GEO PLASMA ENVIRONMENTS P. R. Stannard, G. W. Schnuelle, I. Katz, and M. J. Mandell. . . . .	560
SIMULATION OF CHARGING RESPONSE OF SCATHA (P78-2) SATELLITE G. W. Schnuelle, P. R. Stannard, I. Katz, and M. J. Mandell. . . . .	580

SCATHA SSPM CHARGING RESPONSE: NASCAP PREDICTIONS COMPARED WITH DATA Carolyn K. Purvis and John V. Staskus . . . . .	592
THREE-DIMENSIONAL ANALYSIS OF CHARGING EVENTS ON DAYS 87 and 114, 1979, FROM SCATHA N. A. Saflekos, M. F. Tautz, A. G. Rubin, D. A. Hardy, P. F. Mizera, and J. Feynman . . . . .	608
COMPUTER SIMULATION OF SPACECRAFT CHARGING ON SCATHA A. G. Rubin, H. A. Cohen, D. A. Hardy, M. F. Tautz, and N. A. Saflekos . . . . .	632
ANALYSIS OF AMBIENT AND BEAM PARTICLE CHARACTERISTICS DURING THE EJECTION OF AN ELECTRON BEAM FROM A SATELLITE IN NEAR-GEOSYNCHRONOUS ORBIT ON MARCH 30, 1979 M. S. Gussenhoven, H. A. Cohen, D. A. Hardy, W. J. Burke, and A. Chesley . . . . .	642
COMPARISON OF NASCAP MODELING RESULTS WITH LUMPED-CIRCUIT ANALYSIS David B. Stang and Carolyn K. Purvis . . . . .	665
NASCAP CHARGING CALCULATIONS FOR A SYNCHRONOUS ORBIT SATELLITE N. L. Sanders and G. T. Inouye . . . . .	684
RESULTS FROM A TWO-DIMENSIONAL SPACECRAFT-CHARGING SIMULATION AND COMPARISON WITH A SURFACE PHOTOCURRENT MODEL J. G. Laframboise, S. M. L. Prokopenko, M. Kamitsuma, and R. Godard . . . . .	709
ANALYTICAL MODELING OF SATELLITES IN GEOSYNCHRONOUS ENVIRONMENT N. John Stevens . . . . .	717
CALCULATION OF SURFACE CURRENT RESPONSE TO SURFACE FLASHOVER OF A LARGE SAMPLE UNDER GROUNDED AND FLOATING CONDITIONS M. J. Mandell, I. Katz, and G. W. Schnuelle . . . . .	730
MODEL OF COUPLING OF DISCHARGES INTO SPACECRAFT STRUCTURES A. J. Woods, M. J. Treadaway, R. Grismore, R. E. Leadon, T. M. Flanagan, and E. P. Wenaas . . . . .	745
DISAPPEARANCE AND REAPPEARANCE OF PARTICLES OF ENERGIES >50 KEV AS SEEN BY P78-2 (SCATHA) AT NEAR GEOSYNCHRONOUS ORBIT J. Feynman, N. A. Saflekos, H. G. Garrett, D. A. Hardy, and E. G. Mullen . . . . .	755
SESSION 5 - SYSTEMS DESIGN AND TEST	
MILITARY STANDARDS AND SCATHA PROGRAM UPDATE OF MIL-STD-1541 D. T. Frankos . . . . .	768

MILITARY STANDARD FOR SPACECRAFT CHARGING STATUS REPORT Alan B. Holman . . . . .	772
USE OF CHARGING CONTROL GUIDELINES FOR GEOSYNCHRONOUS SATELLITE DESIGN STUDIES N. John Stevens . . . . .	789
P78-2 SCATHA ENVIRONMENTAL DATA ATLAS E. Gary Mullen, David A. Hardy, Henry B. Garrett, and Elden C. Whipple . . . . .	802
METEOSAT SPACECRAFT CHARGING INVESTIGATION Dierk G. Hoge . . . . .	814
ELECTRON IRRADIATION TESTS ON EUROPEAN METEOROLOGICAL SATELLITE J. Reddy . . . . .	835
SPACECRAFT CHARGING TECHNOLOGY IN THE SATELLITE X-RAY TEST FACILITY Troy J. Sponaugle . . . . .	856
SIMULATION OF SPACECRAFT CHARGING ENVIRONMENTS BY MONOENERGETIC BEAMS Ward Halverson . . . . .	866
IMPORTANCE OF DIFFERENTIAL CHARGING FOR CONTROLLING BOTH NATURAL AND INDUCED VEHICLE POTENTIALS ON ATS-5 AND ATS-6 E. C. Whipple and R. C. Olsen . . . . .	887
A COMPARISON OF THREE TECHNIQUES OF DISCHARGING SATELLITES H. A. Cohen, A. L. Chesley, T. Aggson, M. S. Gussenhoven, R. C. Olsen, and E. Whipple . . . . .	888
ELECTROMAGNETIC FIELDS PRODUCED BY SIMULATED SPACECRAFT DISCHARGES J. E. Nanevicz, R. C. Adamo, B. L. Beers, and T. N. Delmer . . . . .	894
SESSION 6 - ENVIRONMENTAL INTERACTIONS	
AGREEMENT FOR NASA/OAST-USAF/AFSC SPACE INTERDEPENDENCY ON SPACECRAFT- ENVIRONMENT INTERACTION C. P. Pike and N. J. Stevens . . . . .	912
PLASMA INTERACTIONS WITH SOLAR ARRAYS AT HIGH VOLTAGES Norman T. Grier, Craig Smith, and Lisa M. Johnson. . . . .	922
EXPERIMENTAL PLASMA LEAKAGE CURRENTS TO INSULATED AND UNINSULATED $10 \text{ m}^2$ HIGH-VOLTAGE PANELS J. E. McCoy and D. T. Martucci . . . . .	931
NUMERICAL SIMULATION OF PLASMA-INSULATOR INTERACTIONS IN SPACE PART I: THE SELF-CONSISTENT CALCULATION J. H. Nonnast, R. C. Chaky, T. P. Armstrong, J. Enoch, and G. G. Wiseman. . . . .	932

NUMERICAL SIMULATION OF PLASMA-INSULATOR INTERACTIONS IN SPACE	
PART II: DIELECTRIC EFFECTS	
R. C. Chaky, J. H. Nonnast, T. P. Armstrong, J. Enoch, and G. G. Wiseman . . . . .	946
THREE-DIMENSIONAL SPACE CHARGE MODEL FOR LARGE HIGH-VOLTAGE SATELLITES	
David Cooke, Lee W. Parker, and James E. McCoy . . . . .	957
CHARGING OF A LARGE OBJECT IN LOW POLAR EARTH ORBIT	
D. E. Parks and I. Katz . . . . .	979
PANEL DISCUSSION . . . . .	990