

SPECIAL ISSUE

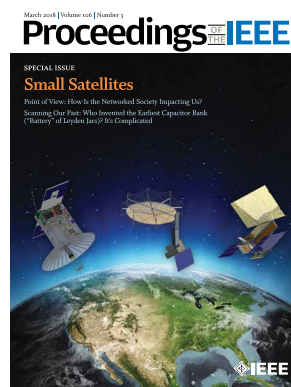
SMALL SATELLITES

Edited by S. Gao, M. N. Sweeting, S. Nakasuka, and S. P. Worden

- 343 Modern Small Satellites—Changing the Economics of Space**
By M. N. Sweeting
|INVITED PAPER| This paper reviews the history of small satellite development and then summarizes their present capabilities and applications, followed by a look at the future technology trends that small satellites can exploit—both in Earth orbit and for exploration of the solar system.
- 362 Space Propulsion Technology for Small Spacecraft**
By D. Krejci, and P. Lozano
|INVITED PAPER| This paper discusses the different propulsion principles applicable to small satellites, and presents a classification of available propulsion solutions, including a variety of different chemical and EP systems of varying complexity and performance.
- 379 Development and Testing of a 3-D-Printed Cold Gas Thruster for an Interplanetary CubeSat**
By E. G. Lightsey, T. Stevenson, and M. Sorgenfrei
|INVITED PAPER| This paper describes the development and testing of a cold gas attitude control thruster produced for the BioSentinel spacecraft, a CubeSat that will operate beyond Earth orbit.
- 391 Advanced Antennas for Small Satellites**
By S. Gao, Y. Rahmat-Samii, R. E. Hodges, and X. X. Yang
|INVITED PAPER| This paper presents a comprehensive review of recent development in antennas for wireless systems (telemetry, tracking and control, high-speed data down-link, radars, navigation and remote sensing, intersatellite links) onboard small satellites (MiniSat, MicroSat, NanoSat, CubeSat).
- 404 Radar Technologies for Earth Remote Sensing From CubeSat Platforms**
By E. Peral, E. Im, L. Wye, S. Lee, S. Tanelli, Y. Rahmat-Samii, S. Horst, J. Hoffman, S.-H. Yun, T. Imken, and D. Hawkins
|INVITED PAPER| This paper reviews the state of the art and future developments of CubeSat radar missions for Earth remote sensing and the implications for NASA’s current and future Earth Science program.
- 419 Energy Storage Technologies for Small Satellite Applications**
By K. B. Chin, E. J. Brandon, R. V. Bugga, M. C. Smart, S. C. Jones, F. C. Krause, W. C. West, and G. G. Bolotin
|INVITED PAPER| This paper provides a general review of performance capabilities of state-of-the-art lithium-ion battery technologies, as well as other advanced energy storage systems for small satellite applications.
- 429 Robotics and AI-Enabled On-Orbit Operations With Future Generation of Small Satellites**
By A. Nanjangud, P. C. Blacker, S. Bandyopadhyay, and Y. Gao
|INVITED PAPER| This paper provides an overview of the robotics and autonomous system (RAS) technologies that enable robotic on-orbit operations on SmallSat platforms.

DEPARTMENTS

- 335 POINT OF VIEW**
How Is the Networked Society Impacting Us?
By T. A. Nirmalathas
- 339 SCANNING THE ISSUE**
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By S. Gao, M. N. Sweeting, S. Nakasuka, and S. P. Worden
- 496 SCANNING OUR PAST**
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By A. Allerhand
- 504 FUTURE SPECIAL ISSUE/SPECIAL SECTIONS**



On the Cover: This month’s cover image highlights a small satellite (RainCube) and two of the supporting technologies (a 1.0-m offset mesh deployable reflector antenna and a MarCO antenna) in space. The left image is courtesy of NASA/JPL-Caltech/Tyvak; the right image comes from a paper in this special issue; and the middle image is courtesy of Tendeg LLC.

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SPECIAL ISSUE: Small Satellites

440 A Survey on Formation Control of Small Satellites

By G.-P. Liu and S. Zhang

|INVITED PAPER| This paper comprehensively reviews the state-of-the-art development in formation control of small satellites including satellite formation flying, distributed satellite systems, and fractionated satellite formation.

458 Onboard Processing With Hybrid and Reconfigurable Computing on Small Satellites

By A. D. George and C. M. Wilson

|INVITED PAPER| This paper surveys the challenges and opportunities of onboard computers for small satellites and focuses upon new concepts, methods, and technologies that are revolutionizing their capabilities, in terms of two guiding themes: hybrid computing and reconfigurable computing.

471 Deployable Techniques for Small Satellites

By Y. Miyazaki

|INVITED PAPER| This paper provides an overview of past and current research and development of a deployable structure for small satellites, and discusses the future of a deployable structure for small satellites.

484 Thermospheric Variations From GNSS and Accelerometer Measurements on Small Satellites

By S. Jin, A. Calabia, and L. Yuan

|INVITED PAPER| This paper presents an overview of past and present developments and efforts in sensing and modeling thermospheric density, wind variations, as well as future challenges and perspectives for GNSS and accelerometers on small satellites.

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