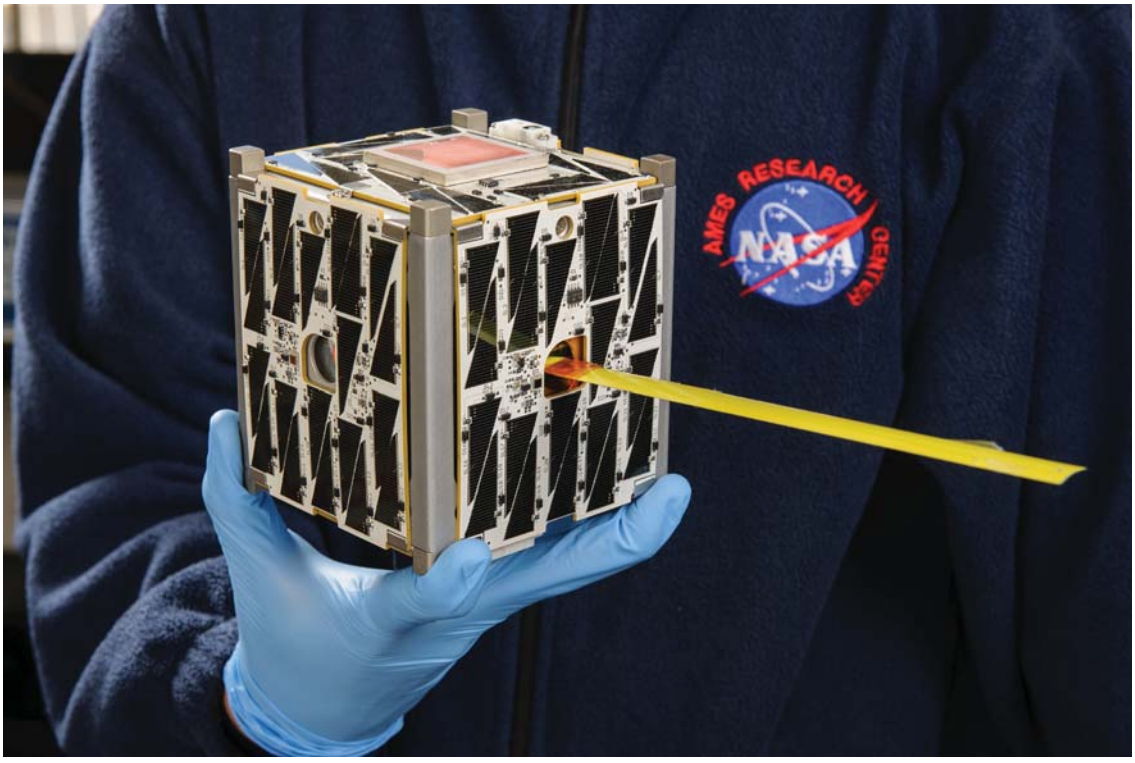
NASAfacts

PhoneSat
The Smartphone Nanosatellite

Following the success of PhoneSat 1.0 and 2.0 Beta, next generation PhoneSats 2.4 and 2.5 continue the innovative use of smartphone technology in small satellites.

PhoneSat 2.4, carried into space on November 19, 2013 aboard a Minotaur I rocket from the Mid-Atlantic Regional Spaceport at NASA's Wallops Flight Facility in Virginia, is the first of the PhoneSat family to use a two-way S-band radio to allow engineers to command the satellite from Earth. This mission also serves as a technology demonstration for a novel attitude determination and control system (ADCS) that establishes and stabilizes the satellite's attitude relative to Earth. Unlike the earlier PhoneSats that used a Nexus One, PhoneSat 2.4 uses the Nexus S smartphone, which runs Google's Android™ operating system, and is made by Samsung Electronics Co., Suwon, So. Korea. The smartphone provides many of the functions needed by the satellite such as a central computer, data memory, ready-made interfaces for communications, navigation and power all pre-assembled in a rugged electronics package.

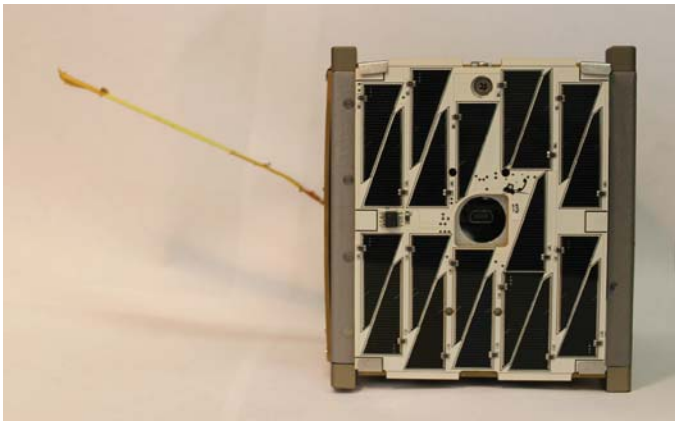
PhoneSat 2.5, slated for a February 2014 launch, has similar objectives as 2.4, namely to confirm that a low-cost commercially available off-the-shelf (COTS) ADCS works in space and to verify that the Android system can work as a S-Band command and telemetry modem. With an expected orbital life-time of up to 2 years, both 2.4 and 2.5 will provide further confidence in the PhoneSat concept and components by demonstrating long-term radiation survivability. This innovative application of commercially developed technologies for use in space provides for low cost, low risk, highly iterative missions capable of supporting a number of Agency science and exploration objectives.



PhoneSat 2.5 Image Credit: NASA Ames Research Center / Dominic Hart

The series of PhoneSat missions comprises a pathfinder program for the upcoming Edison Demonstration of Smallsat Networks (EDSN) mission in which eight identical 1.5 unit (10x10x15cm and 2.5kg) cubesats will be deployed on a single launch in 2014. The EDSN mission will demonstrate the concept of using many small spacecraft in a coordinated cluster to study the space environment and space-to-space communications architectures. The eight EDSN satellites will each have a Nexus S smartphone for satellite command and data handling with a scientific instrument added as a payload on each one. The PhoneSat missions are important precursors for the EDSN mission because of their ability to gain operational experience with critical spacecraft subsystems common to both missions.

The first PhoneSat missions launched in April, two PhoneSat 1.0s and single PhoneSat 2.0-Beta, confirmed the viability of using smartphones and other commercially available consumer-grade electronics



PhoneSat 2.0 with Triangular Advanced Solar Cells

in satellites destined for low Earth orbit. Smartphones offer a wealth of capabilities needed for satellite systems such as fast processors, versatile operating systems, multiple miniature sensors, high-resolution camera interfaces, and GPS receivers. All PhoneSat nanosatellites are each a one cubesat unit - a satellite in a 10 cm cube (approx. 4 inches) or about the size of a tissue box - and weighs approximately 1 kg (2.2 pounds). Engineers believe PhoneSat-derived technology and approaches will enable NASA to launch multiple new satellites capable of conducting science and exploration missions at a small fraction of the cost of conventional satellites.

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The PhoneSat team at NASA Ames Research Center

The PhoneSat project is series of a technology demonstration missions funded by the Small Spacecraft Technology Program (SSTP), one of nine programs within NASA's Space Technology Mission Directorate, and the Engineering Directorate at NASA Ames Research Center. The SSTP develops and matures technologies to enhance and expand the capabilities of small spacecraft with a particular focus on communications, propulsion, pointing, power, and autonomous operations. The PhoneSat project started in summer 2009 as a student-led collaborative project between NASA Ames and the International Space University, Strasbourg.

For more information about PhoneSat, visit:
http://www.nasa.gov/directorates/spacetech/small_spacecraft/PhoneSat.html

For more information about SSTP, visit:
http://www.nasa.gov/directorates/spacetech/small_spacecraft

For more information about Ames Engineering, visit:
http://www.nasa.gov/ames/engineering/index.html

For more information about the Cubesat Launch Initiative, visit:
http://www.nasa.gov/directorates/heo/home/CubeSats_initiative

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