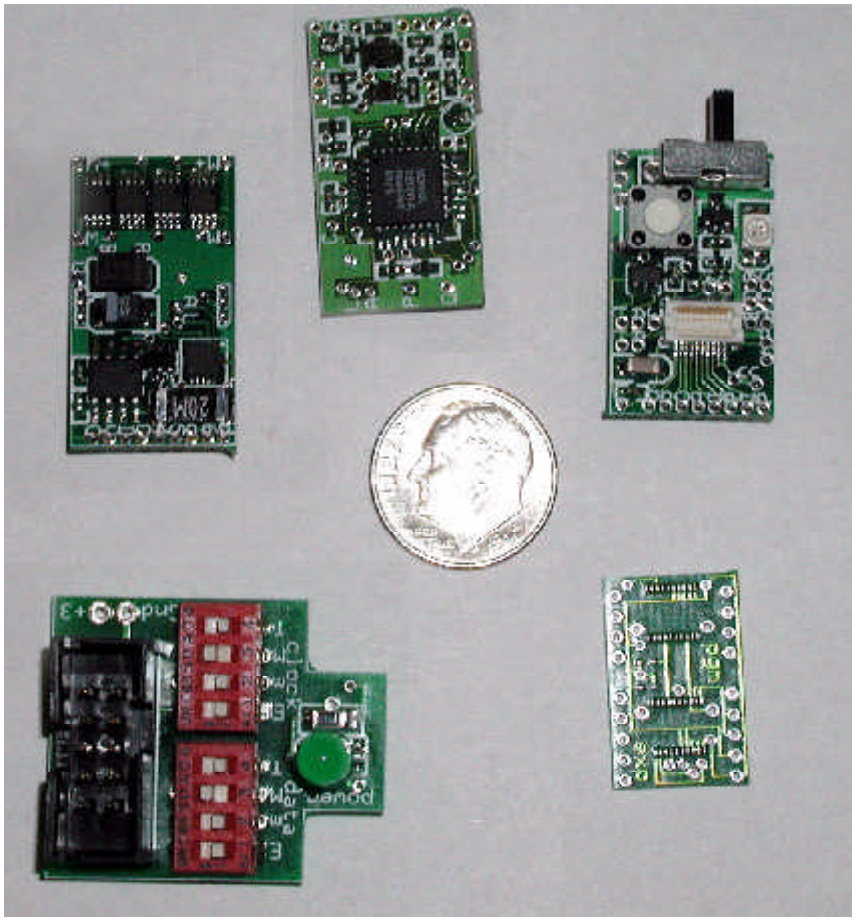
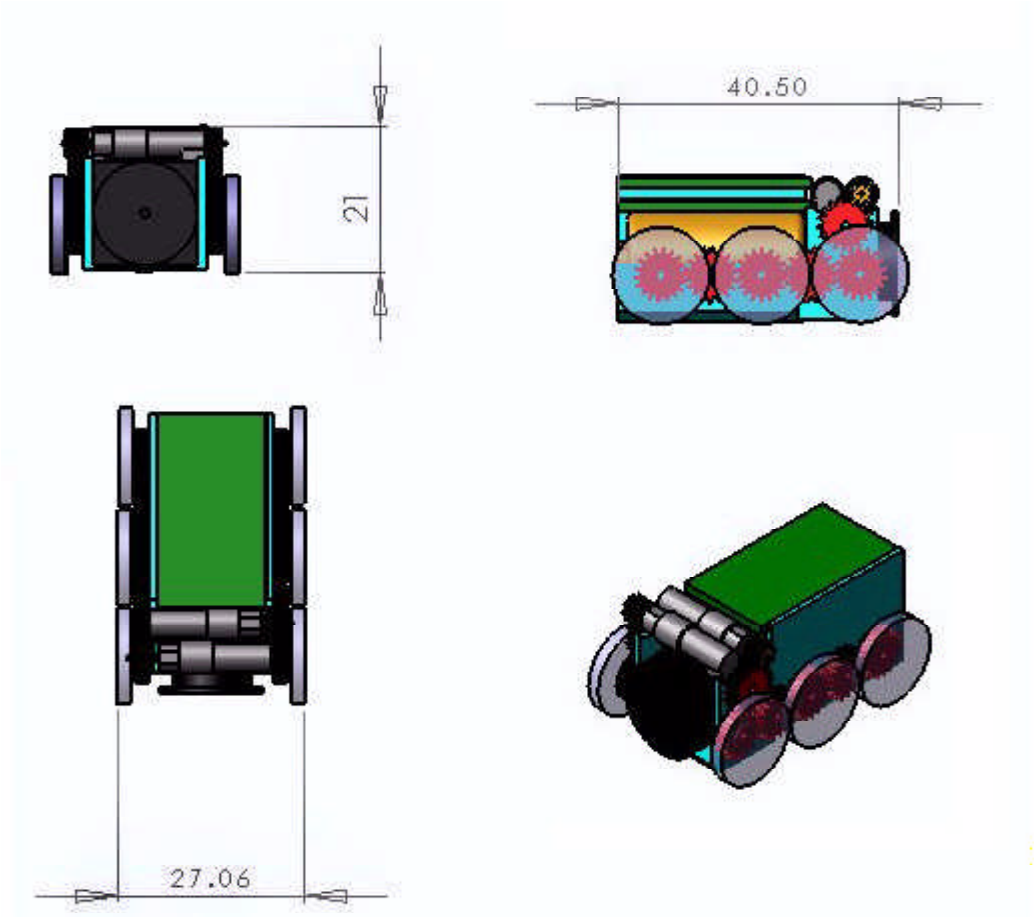
Mobile Sensor Technologies Being Developed

The NASA Glenn Research Center is developing small mobile platforms for sensor placement, as well as methods for communicating between roving platforms and a central command location.



Sensor platform electronics suite.

The first part of this project is to use commercially available equipment to miniaturize an existing sensor platform. We developed a five-circuit-board suite, with an average board size of 1.5 by 3 cm. Shown in the preceding photograph, this suite provides all motor control, direction finding, and communications capabilities for a 27- by 21- by 40-mm prototype mobile platform (see the following photograph).



Mobile platform rendering. All dimensions given in millimeters.

The second part of the project is to provide communications between mobile platforms, and also between multiple platforms and a central command location. This is accomplished with a low-power network labeled "SPAN," Sensor Platform Area Network, a local area network made up of proximity elements.

In practice, these proximity elements are composed of fixed- and mobile-sensor-laden science packages that communicate to each other via radiofrequency links. Data in the network will be shared by a central command location that will pass information into and out of the network through its access to a backbone element. The result will be a protocol portable to general purpose microcontrollers satisfying a host of sensor networking tasks. This network will enter the gap somewhere between television remotes and Bluetooth[1] but, unlike 802.15.4,[2] will not specify a physical layer, thus allowing for many data rates over optical, acoustical, radiofrequency, hardwire, or other media. Since the protocol will exist as portable C-code, developers may be able to embed it in a host of microcontrollers from commercial to space grade and, of course, to design it into ASICs.[3] Unlike in 802.15.4, the nodes will relate to each other as peers.

A demonstration of this protocol using the two test bed platforms was recently held. Two NASA modified, commercially available, mobile platforms (see the final photograph) communicated and shared data with each other and a central command location. Web-

based control and interrogation of similar mobile sensor platforms have also been demonstrated. Expected applications of this technology include robotic planetary exploration, astronaut-to-equipment communication, and remote aerospace engine inspections.

Communications test bed (Koala experimental platform).

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[1]2.4-GHz ISM band, low-power network protocol for shortrange data and voice transfer.
[2]Proposed ISM band (band reserved for industrial, scientific, and medical purposes), low-power network control.
[3]Application-specific integrated circuit--an integrated circuit fabricated to address a specific application