**Software**

**Traffic-Light-Preemption Vehicle-Transponder Software Module**

A prototype wireless data-communication and control system automatically modifies the switching of traffic lights to give priority to emergency vehicles. The system, which was reported in several NASA Tech Briefs articles at earlier stages of development, includes a transponder on each emergency vehicle, a monitoring and control unit (an intersection controller) at each intersection equipped with traffic lights, and a central monitoring subsystem. An essential component of the system is a software module executed by a microcontroller in each transponder. This module integrates and broadcasts data on the position, velocity, acceleration, and emergency status of the vehicle. The position, velocity, and acceleration data are derived partly from the Global Positioning System, partly from deductive reckoning, and partly from a diagnostic computer aboard the vehicle. The software module also monitors similar broadcasts from other vehicles and from intersection controllers, informs the driver of which intersections it controls, and generates visible and audible alerts to inform the driver of any other emergency vehicles that are close enough to create a potential hazard. The execution of the software module can be monitored remotely and the module can be upgraded remotely and, hence, automatically.

*This program was written by Aaron Bachelder and Conrad Foster of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).*

*This software is available for commercial licensing. Please contact Don Hart of the California Institute of Technology at (818) 393-3425. Refer to NPO-30444.*

**Central-Monitor Software Module**

One of the software modules of the emergency-vehicle traffic-light-preemption system of the two preceding articles performs numerous functions for the central monitoring subsystem. This module monitors the states of all units (vehicle transponders and intersection controllers): It provides real-time access to the phases of traffic and pedestrian lights, and maps the positions and states of all emergency vehicles. Most of this module is used for installation and configuration of units as they are added to the system. The module logs all activity in the system, thereby providing information that can be analyzed to minimize response times and optimize response strategies. The module can be used from any location within communication range of the system; with proper configuration, it can also be used via the Internet. It can be integrated into call-response centers, where it can be used for alerting emergency vehicles and managing their responses to specific incidents. A variety of utility subprograms provide access to any or all units for purposes of monitoring, testing, and modification. Included are “sniffer” utility subprograms that monitor incoming and outgoing data for accuracy and timeliness, and that quickly and autonomously shut off malfunctioning vehicle or intersection units.

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**Intersection-Controller Software Module**

An important part of the emergency-vehicle traffic-light-preemption system summarized in the preceding article is a software module executed by a microcontroller in each intersection controller. This module monitors the broadcasts from all nearby participat-