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## Tempest News

### Software of the Year (1998)

Posted by [admin](#) on 2002-Jan-11 09:33

Reprinted from [Microgravity News](#), winter 1998

Engineers Maria Babula, Lisa Lambert, Joe Ponyik, and Dave York, of the Flight Software Engineering Branch at Lewis Research Center (LeRC) in Cleveland, Ohio, along with Rick Tyo, of Intel Corporation, were presented with a 1998 NASA Software of the Year Award on November 5 at the Technology 2008 conference held in Boston, Massachusetts. The LeRC team won for developing Tempest, the first computer software that enables individuals to use standard World Wide Web browsers as an interface for conducting scientific experiments. NASA established the annual award in 1994 to recognize the development of innovative software technology that advances both NASA research and commercial initiatives that help American industry maintain world-class technology status.

Tempest was developed to support science experiments that will be conducted in NASA's Fluids and Combustion Facility (FCF) planned for the International Space Station (ISS). The FCF is expected to accommodate up to 300 combustion and fluid physics experiments during the ISS's projected lifetime of 10 to 15 years. A study indicated, however, that to write software tailored for the control of each FCF experiment and for the various computers used by numerous ground-based and in-flight investigators would require 60 programmers working full-time for three years. According to Ed Winsa, FCF project manager, avoiding this drain on personnel and experiment budgets meant "being creative and inventing a whole new way of doing software." Winsa challenged the engineers of the LeRC Flight Software Engineering Branch to "come up with a revolutionary way of doing software, not an evolutionary way."



From left to right: Engineers Maria Babula, Lisa Lambert, Joe Ponyik, and Dave York, of LeRC's Flight Software Engineering Branch, after receiving the 1998 NASA Software of the Year Award, presented by David Nelson, acting deputy chief information officer at NASA headquarters. In answer to that challenge, the group invented embedded web technology (EWT) and wrote Tempest to apply this technology. EWT uses Internet technology to remotely control embedded systems, which are microprocessors built into machines such as automobiles and refrigerators, with directions given in real time. With Tempest, FCF experiments can now be controlled and monitored with one piece of software. "Tempest will be a fixed feature embedded in the FCF," says Ponyik. As a result, software development and maintenance costs for FCF experiments will be cut

significantly. Considerable savings will also result from reduced weight, since astronauts will no longer need separate laptop computers and removable disks for every experiment. (Each pound of equipment currently costs \$10,000 to launch into space.) Experiments can be conducted with greater efficiency, as well. For instance, astronauts need only to start up their computer's web browser and type in the Internet address of the FCF experiment to have access to experiment controls, says Ponyik. Also, because EWT simplifies the adaptation of flight displays to ground operations, more responsive adjustments to experiments can be made by investigators observing from Earth, since they will now be able to view the same experiment data screens seen by astronauts. Investigators will also be able to access data from any location, not just from a NASA payload operations center, a critical ability because experiments will be conducted for longer durations on the ISS, explains Ponyik. Other ISS experiments should benefit from the application of Tempest as well.

What makes Tempest remarkable, according to Ponyik, is its adaptability. Adds York, "Here is a case where microgravity science and technology research has produced important technology that can be transferred to American industry." Tempest is expected to foster the growth of a multibillion-dollar web-based industry for monitoring and controlling devices ranging from automobiles to medical implants from remote locations with Internet access. According to Paul Curto, senior technologist of NASA's Inventions and Contributions Board, many major corporations are presently training personnel to use Tempest-like servers for

embedded microprocessor control systems.

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