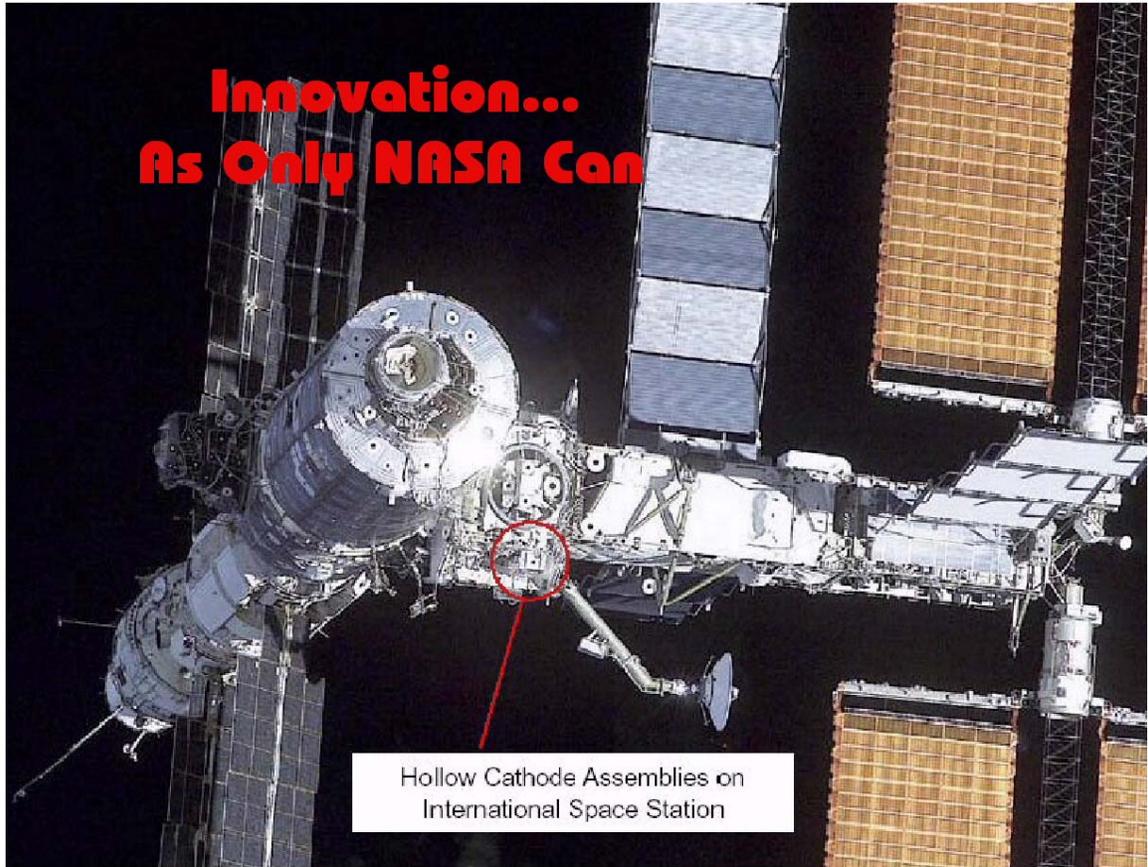


**Innovation...  
As Only NASA Can**



Hollow Cathode Assemblies on  
International Space Station

**(For inside the front cover)**

Message from the Chair, Inventions and Contributions Board

**(Insert picture of Theron Bradley)**

I am pleased to present the Annual Report on the activities of the Inventions and Contributions Board (ICB) for 2002. I reported as NASA's Chief Engineer in July of this year and at that time assumed Chairmanship of the ICB. Even though I have only been working with the ICB and our scientists and engineers for a short time, my Board work has already become one of my most invigorating duties. Technologies produced by and for NASA are truly significant and being a part of the process through which we recognize our innovators has been a pleasure. I have also enjoyed dedicated and resourceful ICB members, in addition to Staff and Center personnel to assist me with my responsibilities. Their expertise, interest and dedication are key factors in the success of the Space Act Awards.

. I invite everyone to review the award winning technologies in NASA's inventory, especially the exceptional technologies listed in this report. I think you will find many of them truly amazing. As we move forward to achieve NASA's vision, we will need more innovations and we also need to further disseminate these to insure their widest possible use.

Speaking for the other ICB members as well as myself, I congratulate all our innovators for helping us to achieve "Innovation...as only NASA can."

Theron M. Bradley, Jr.  
Chief Engineer  
Chair, Inventions and Contributions Board

# Innovation...As Only NASA Can

## FY2002 Annual Report of the Inventions and Contributions Board

### Abstract:

FY2002 brought significant leadership changes with the appointment of a new NASA Administrator, Inventions and Contributions Board (ICB) Chair and Chief Engineer and Staff Director. With NASA's change in administration came a mission and vision for the future direction and management of the Agency as well as many new initiatives. The ICB moved ahead with renewed vigor, recognizing that we have a unique opportunity to contribute to this new direction.

This year the Board recognized some of the most valuable contributions to NASA in its history, including the life saving Ventricular Assist Device, futuristic deep space mission enabling electric propulsion technologies and software simulation tools extending the envelope of fluid science.

**(Insert ion\_engine.jpg)**



Deep Space Ionic Electric Propulsion Engine

## NASA's Space Act Awards

The Space Act Award recognizes a specific scientific or technical innovation that is of significant value to the aeronautical or space activities of NASA. The award is an individual personal monetary award along with a certificate signed by either the Chair of the Inventions and Contributions Board (ICB), the Chief Engineer, or by the Administrator. The award is available to a NASA employee, NASA contractor, other government agency employee or contractor, as well as members of the public. One key requirement is that the government must have the right to use the innovation without additional charges or fees. For most of the NASA-funded efforts this automatically conveys with the funding for contracts, grants or partnerships. For others, this is one purpose of the award incentive, i.e. to recognize and award the contribution of the rights to the government. Another purpose is to incentivize the disclosure and publicity of the technologies, so the widest possible dissemination can insure the greatest benefit from their use.

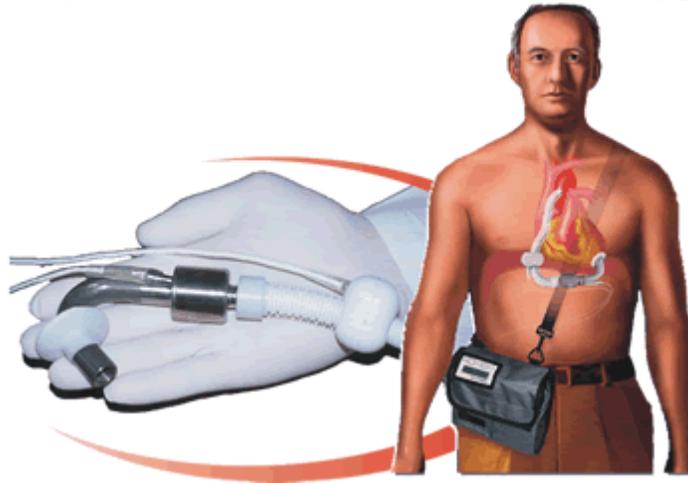
The ICB determines the amount of the award using the Space Act criteria including "...value to the United States." Congress gave NASA the authority to grant awards up to \$100,000 for each innovation. Recent awards have ranged from \$350 to more than \$50,000 for some truly valuable contributions, such as the recent winners of the NASA Invention of the Year and Software of the Year. Space Act awardees represent a large pool of valuable NASA technologies available for further use.

In addition to cases that come before the ICB for determination of value, the ICB has previously determined a specific value for each of three discrete events: when NASA has filed a patent application, when a NASA Center official has released software or when a Center has approved an article for publication in Tech Briefs magazine. Awards for these events, known as initial awards, are available for disclosed innovations that are scientific and technical in nature. The ICB's previously assigned values, per contributor, of these contributions to aeronautical and space activities are \$350 for the Tech Briefs article or \$500 for the patent application or software release (\$1000 for each of the latter two if there is only a single contributor to the innovation).

There are no runners-up or losers in these awards either, as each case that qualifies is separately judged and awarded.

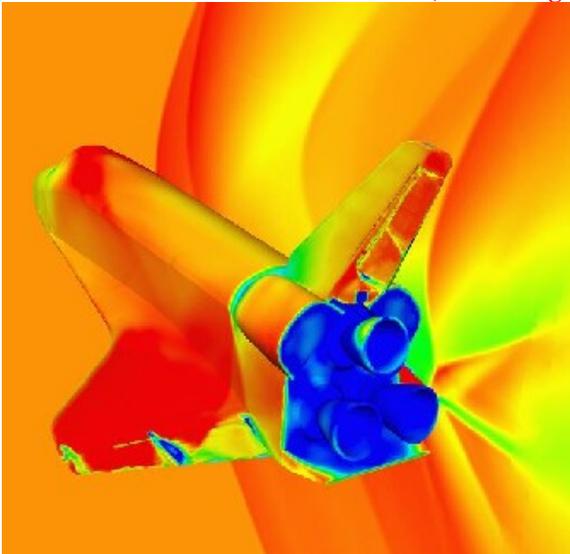
Visit the ICB website at <http://icb.nasa.gov/> to obtain more information on the Space Act Awards program.

(DeBakey Heart pumpman%20with%20hand%20and%20pump.jpg)



The value of the scientific and technical contributions recognized this year was one of the largest in the Board's history. In monetary terms, the Board awarded technologies with an estimated value to NASA in the billions of dollars. The considerable benefits of these innovations include saving and enriching lives by using innovations such as the Ventricular Assist Device (i.e. Heart Pump) from Johnson Space Center and Ames Research Center, where over 100 lives have already been saved. It is estimated that many thousands will eventually be saved as the device is introduced to widespread use in the future as NASA moves forward "...To improve life here." Also receiving awards this year were significant space systems developments by the Jet Propulsion Lab in quantum cameras and the Goddard Space Flight Center in satellite flight control that have contributed to the improvement of life here. The Board awards recognized that our operations "...To extend life there." were enhanced by technologies such as the new gas detection systems developed at the Kennedy Space Center. The Board this year awarded key efforts that are furthering NASA's vision "...To find life beyond." such as through deep space enabling technologies from Glenn Research Center for ionic electric propulsion that were demonstrated on Deep Space 1.

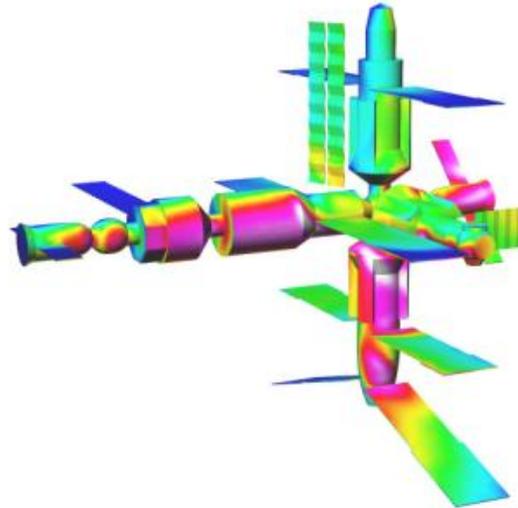
(Insert-----graphicCART3D-1.jpg)



Ames Research Center: Cart3D: A Package for Automated Cartesian Grid Generation and Aerodynamic Database Creation by Michael Aftosmis, John Melton, ARC and Marsha Berger, NYU Courant Institute "Cart3D is a high fidelity geometry processing and flow and electromagnetic field analysis package that automates conceptual and preliminary aerodynamic design. Cart3D's approach to geometry processing and

space discretization enables simulation of complex geometries in fields outside of aerospace ranging from astrophysics to computer science to electromagnetics."

- The DAC software is used to provide the highest available fidelity predictions of plume impingement for orbiting structures. Distribution of U.S. Space Shuttle RCS plume loads on the Russian Mir Space Station at a distance of 5 meters while exercising a Norm-Z burn.



In total, the Board met five times and awarded over seven hundred technologies in FY2002. Just this year, over 1800 innovators from NASA, from industry and from academia were recognized for their contributions. The last Board meeting was conducted by ViTs or video teleconference and was pronounced very successful by the participants. This should allow greater participation in future meetings by eliminating travel time and the trip to Headquarters. Over the past several months, the pace of awards being submitted has increased as our Staff has begun to publicize the awards and to promote the reporting of new technologies to expand NASA's inventory of innovations that we will need to "...extend life to there."

The Board was also instrumental in proposing and getting approval for a new NASA honor award medal to recognize those innovators who are doing the early research and development efforts, typically in Technology Readiness Levels (TRLs) under "six." Also included in the eligibility for this award are the technology transfer and commercialization champions who add value by insuring the widest possible use of the technology. The latter awards do not fall under the Space Act Awards and the purview of the Board, but certainly contribute to NASA's vision to use our technologies "...to improve life here."

(Insert medal design graphic Exceptional Technology Medal.doc)



The processes involved in Space Act Awards have also been analyzed and as a result, several improvements have been developed. The process of award requests, processing and payments is an intensive manual process with many opportunities for errors and delays. Moving forward with initiatives under the President's Management Agenda for Strategic Management of Human Capital, we have defined a process for electronic funds transfer process and a successful pilot was conducted at Marshall Space Flight Center. In this pilot, the award payments were made within eight weeks of when the ICB Staff received the requests for awards. This compares favorably with the eight months nominal for the existing process. The ICB Staff is working to expand the process to all NASA Centers as well as non-NASA employees within the coming year.

In addition, to help advance the President's Management Agenda for Enhanced Electronic Government, a Software Requirements Document has been issued for automating the request process. This process uses a new web portal entitled Automatic Web-enabled Award Request Documentation or AWARD. This module will use existing systems such as eNTRe and TechTracs as a model and a common database. The added benefits of this module will include reduced development costs, automated collection of management metrics and a common historical database accessible by all parties involved in the process.

New opportunities were also explored in outreach and effectiveness. A "NASA Innovators" workshop was organized to stimulate interest in children to become future innovators in our Nation's space and aeronautical programs. To help advance the President's Management Agenda initiatives for Expanded Electronic Government and Strategic Management of Human Capital, the ICB developed a new electronic

awards payment system, defined a new web enabled data entry module and conducted the first Board meeting by video teleconference. The Board looks forward to the coming year when many of these initiatives will be in full effect. The Board believes that to achieve our future vision within the resources available, NASA's future innovations must exceed its successful past. The ICB was created to provide incentives for achieving scientific and technical innovation in the conduct of NASA's aeronautical and space programs, therefore, we look forward to using these awards to inspire "Innovation...as only NASA can."

**(Insert photo Hussey-TYDTWD.jpg)**



Take Our Daughters to Work Day was attended by over 175 schoolchildren, who interacted with two of NASA's more prolific innovators via video teleconference with Langley Research Center. These innovators, who between them have over 30 patents, were a wonderful inspiration to "...our next generation of explorers." as these children may be the future innovators for NASA. The children were also interested in our display of many of the commercial products based on NASA technologies.

(Insert GRC visit picture here)



Dr. Bruce Banks (left) of Glenn Research Center describes his latest inventions to Mr. Walter Hussey (right), ICB Director of Staff, and

As valuable as the Space Act Awards were in the early days of NASA, they are even more so today as NASA has been asked to go farther and contribute more "...for the benefit of mankind." than ever before. To realize this return on investment, the Board has begun publicizing the availability of these awards and the technologies they represent, removing barriers in the administration of the process, reaching out to underserved communities, increasing effectiveness of the awards and aligning with NASA's new mission and vision. The Board is working hard to provide the inspiration for "Innovation...as only NASA can."

The ICB continues to produce annual metrics for performed management of the Awards which are available on the website. These metrics show an increasing trend in the value of the work being done at and for NASA, specific highlights this year's include: increased (122), record number of exceptional technical contributions in FY'02 (21) and, record number of software cases awarded in FY'02 (159).

The National Aeronautics and Space Act of 1958 that established NASA also created the Inventions and Contributions Board and the Space Act Awards.

### **National Aeronautics and Space Act**

PL No. 85-568 Title III Sec.306 "...a monetary award... to any person...for any scientific or technical contribution to the Administration which is determined to have significant value in the conduct of aeronautical and space activities. Each application for such award shall be referred to the Inventions and Contributions Board...shall take into account—

- (1) the value of the contribution to the United States;
- (2) The aggregate amount of any sums, which have been expended by the applicant for the development of such contribution;
- (3) The amount of compensation...previously received by the applicant for or on account of the use of the contribution by the United States;

...No award shall be made ...

- (1) Unless the applicant surrenders...all claims which such applicant may have to receive any compensation...for the use of such contribution by or on behalf of the United States...

## **2002**

### **Exceptional Awards**

Cart3D: Automated Cartesian Grid Generation and Aerodynamic Database Creation (ARC)

Hydroformed Ion Optics and Spall-Resistant Woven Screen Surfaces for Ion Thrust (GRC)

Non-Invasive Fiber-Optic Probe for Early Detection of Eye and Bodily Diseases (GRC)  
Hollow Cathode Assembly for the International Space Station Plasma Contactor (GRC)  
AutoCon – Autonomous Maneuver Control Flight Software (GSFC)  
Computer Implemented Empirical Mode Decomposition (GSFC)  
Micro-Gas Chromatograph, etc. for a field portable Mass Spectrograph (JPL)  
Interferometric SAR (Synthetic Aperture Radar) Processor for Elevation (JPL)  
High Performance Bound to Quasibound Quantum Well Infrared Photodetector (JPL)  
Design and Measurements with the Reversal Electron Attachment Detector (JPL)  
Compact Ultraviolet-Infrared Imaging Spectrograph/Camera (JPL)  
GaAs/AlxGal-xAs Quantum Well Infrared Photodetector (JPL)  
Emergency Vehicle Intersection Preemption System (JPL)  
Column Loading Input Chip (JPL)  
Rotary Blood Pump, Ventricular Assist Device (JSC)  
DSMC Analysis Code (DAC) Software for Simulating Rarefied Gas Dynamic Environments (JSC)  
Implantable Digital Hearing Aid (KSC)  
Hazardous Gas Detection System (HGDS) 2000 Software (KSC)  
Inexpensive Measurement of Hydrogen Concentrations in Inert Launch Environments (KSC)  
LARC RP46: High-Temperature Polyimide Resin System (LaRC)  
Method & Apparatus For The Portable Identification Of Material Thickness Of Layers (LaRC)

For more information on Space Act Awards please visit: [icb.nasa.gov](http://icb.nasa.gov)