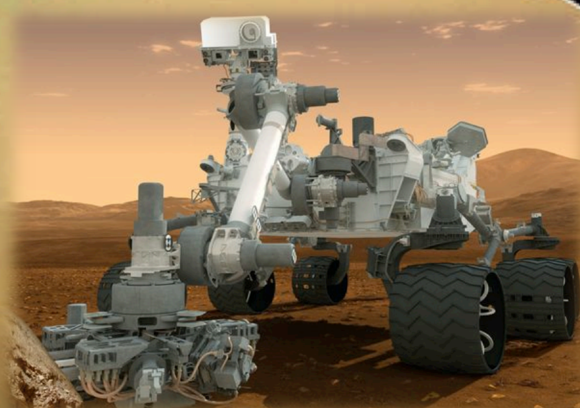
National Aeronautics and Space Administration



The Annual Report of the NASA Inventions & Contributions Board (ICB) for Fiscal Year 2012

Inventing to Explore

Index

On the Cover:

In the center is a computer rendering of the Mars Science Laboratory Curiosity Rover, which landed on Mars on August 6, 2012. The angled rectangle in the background is the first color image sent back to NASA from Mars by the rover.

Photo credit: NASA/JPL-Caltech

Foreword

2012 has been a year of adjustment and accomplishment for NASA. From the bittersweet retirement of the Orbiters to the bold landing of the Curiosity rover on Mars, the Agency has shown much necessary progress. This progress will ever be fueled by innovation, not just routine advances, but confident strides. For fiscal year 2012, the ICB implemented evaluation criteria to increase the recognition of the more revolutionary technologies. This new weighting aligns the ICB with the NASA Office of the Chief Technologist and looks ahead to the bright future of exploration our nation has entrusted to us. I appreciate the time that you are about to take with me now to consider the brightest NASA technological contributions of the past year.

Dr. Michael G. Ryschkewitsch, ICB Chair
NASA Chief Engineer

Introduction: Recognizing Aerospace Innovation

The members of the NASA Inventions and Contributions Board are dedicated to recognizing aerospace inventors in a formal and meaningful way. The monetary awards distributed are not in the form of program funding, but as compensation directly to the inventors. They are not lightly given, either. Awards Liaison Officers (ALO's) at each Center validate and submit applications as they become aware of the technologies. Each submitted technology must document that it meets the criteria of being significant, scientific, technical, and aerospace in nature.

Board Action awards, including the two yearly competitions, are evaluated at least three times before being sent forward for approval and payment. The initial evaluation is performed by the ICB Chief Technologist who develops scores and points recommendations. Subsequently, at least three ICB members review the initial evaluations and recommendations before the bimonthly ICB meeting. Finally, a group discussion is held at the ICB meeting to fine tune the scores until the ICB comes to a consensus they are scored accurately. The ICB is conscientious, since they have the authority to recommend awards up to $100,000 to employees of NASA and its industry partners. With special congressional notification, even larger awards are possible, should the ICB feel a technical advance is monumental enough. Despite a reduced budget this year, the ICB approved 1771 individual cash awards totaling nearly $1.3 million dollars this year.

Background – The origin of NASA Invention Awards

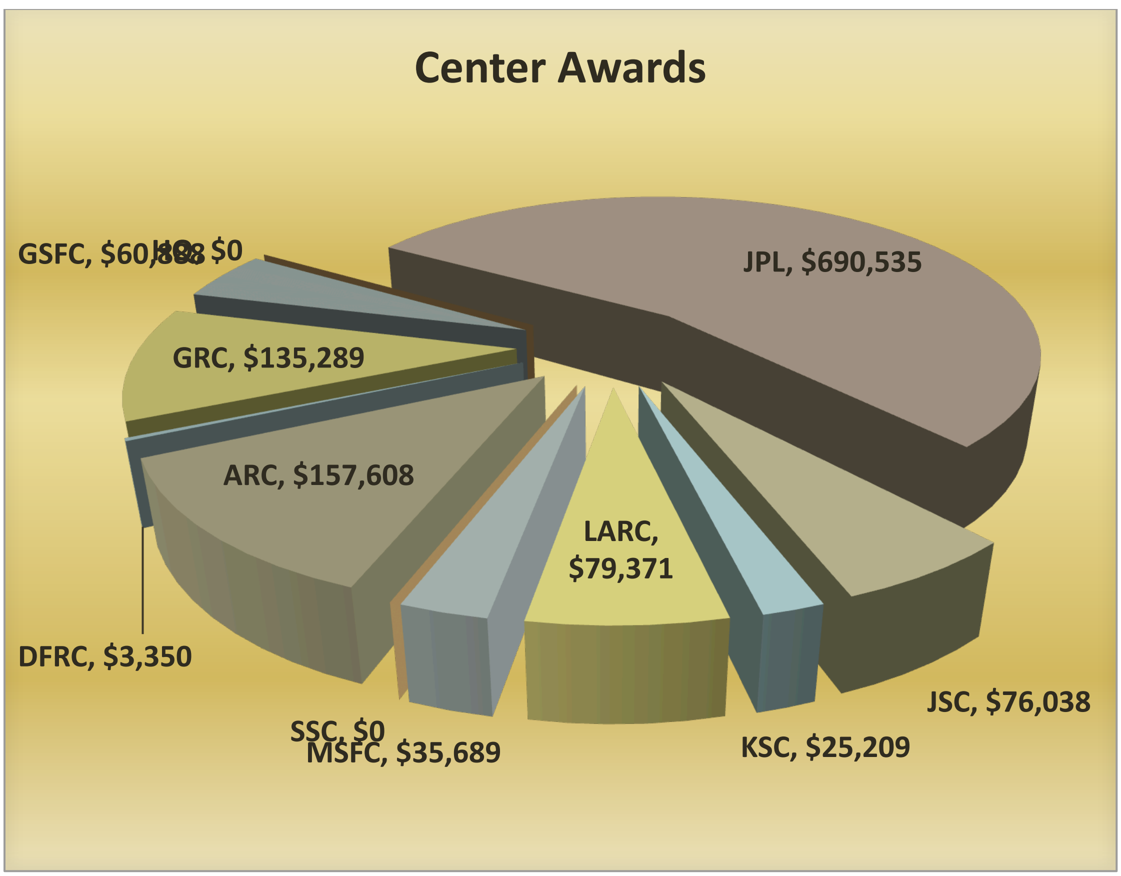
When Congress expanded the role of the former National Advisory Committee of Aeronautics (NACA) to include space flight in the Space Act of 1958, NASA was born. Those who drafted the Space Act knew the main challenges would be developing the technologies to advance flight and space exploration. As the scope of the mission was expanded, so was the Agency's authority to recognize those who made the technological advances. Since 1958, well over one hundred thousand awards have been distributed to inventors. Previous annual reports with details on the most notable of these technologies are archived online at http://www.nasa.gov/offices/oce/icb/Annual_Report.html.

Performance- 2012 Awards Statistics and Metrics

The Invention Awards Program is available to all NASA funded inventors working on NASA projects whether they are NASA civil servants, contractors, or students. The number of inventors approved for the various award types is as follows:

1. 269 Board Action Awards for individuals were granted in 5 meetings.
2. 885 patent applicants were awarded.
3. 439 software authors were awarded.
4. 178 NASA Tech Briefs certificates authorized.
5. There were 9 Exceptional cases- inventions on a nomination with at least one inventor who was approved for an award of $5,000 or more.

The awards program participation levels across the Agency vary as the chart below shows.



Exceptional ICB Award Cases

Each year, several ICB award applications result in at least one awardee receiving $5000 and are designated as Exceptional Awards. These Exceptional Awards must go to the NASA Administrator for approval prior to payment. The following descriptions of the Exceptional Board cases for 2012 are identified by a unique tracking code which consists of a three letter code designating the lead NASA Center for its development and a five digit number assigned to it at the time it was reported to NASA. The lead NASA Center code definitions are:

Ames Research Center: ARC
Dryden Flight Research Center: DFRC or DRC
Glenn Research Center: GRC or LEW (formerly Lewis Research Center)
Goddard Space Flight Center: GSC or GSFC
Kennedy Space Center: KSC
Langley Research Center: LaRC or LAR
Jet Propulsion Laboratory: JPL or NPO (formerly NASA Pasadena Office)
Johnson Space Center: JSC or MSC (formerly Manned Spaceflight Center)
Marshall Space Flight Center: MSFC or MFS
Stennis Space Center: SSC
Headquarters: HQ

2011 Invention of the Year (IOY)

This distinguished competition is sponsored by the NASA Office of the General Counsel (OGC) to underscore the significance of the NASA Patenting Program. The competition is held after the eligibility period is concluded, thus the 2011 IOY competition was held in 2012. The Agency can present IOY awards in two categories: (1) the NASA Commercial IOY and (2) the NASA Government IOY (if the NASA General Counsel determinates they are warranted). Each Center may submit a maximum of two technologies as long as they have at least one NASA civil servant inventor on the issued patent. In the event of multiple submissions, all nominations are considered for both award categories. The ICB may elect to recommend awards for one, both, or neither category if the circumstances warrant it.

The ICB and the OGC selected both Commercial and Government IOY's for 2011. The eligibility requirements for the NASA Commercial IOY award are linked to the National Inventor of the Year event promoted by the Intellectual Property Owners Educational Foundation (IPOEF), to which the Commercial IOY may be nominated. Only inventions that were commercialized to non-government customers from four years (2008-2011) prior to and including the competition year can be considered.

The eligibility requirements for the NASA Government IOY are based on the impact the nominated inventions have had on NASA's mission and in other government programs. While commercial sales may exist, the deciding factor for the Government IOY Award is the value of the Government uses of the chosen nomination.

The 2011 NASA Government IOY Award for 2011 was conferred upon TUFROC (ARC-15201-1): The Toughened Uni-piece Fibrous Reinforced Oxidation-resistant Composite is a light-weight two-piece thermal protection system used to protect the hottest parts of a returning space vehicle during atmospheric entry at hypersonic speed. It consists of a high temperature, impregnated, carbonaceous cap attached to a lightweight fibrous silica-base material. The carbon-based cap is mechanically attached to the insulating base to ensure the wings' leading edge remains dimensionally stable (i.e. no shape change) while the base provides maximum insulation for the spacecraft structure during Earth entry at hypersonic speed. The key to the design is a number of innovative features that allow for the successful integration of the surface treated carbon-based cap with the insulating base. Without the cap, the system would fail

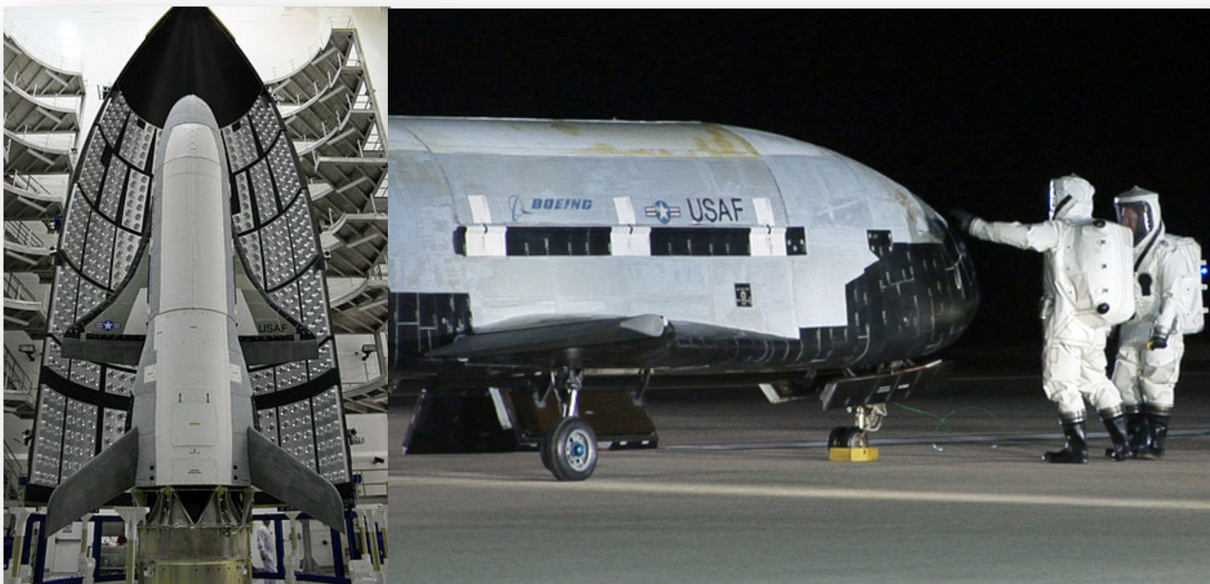


Figure 1: The X-37B reusable space vehicle before launch (left) and after landing (right).

mechanically due to a thermal expansion mismatch, chemically due to oxidation or other decomposing reactions, or thermally due to melting or sublimation. TUFROC has been successfully flown on two X-37B unmanned space vehicles (Figure 1), with a third mission planned. The TUFROC leading edge protection has been performing reliably during the hypersonic reentry and promises trouble free operation on subsequent missions.

The 2011 NASA Commercial Invention of the Year is the Solar-Powered Refrigeration System (MSC-22970-1)

The World Health Organization (WHO) estimates more than two billion people in the world are without access to electricity. This Johnson Space Center technology is a solar powered vapor compression refrigeration system that can protect its contents overnight without battery backup power. The variable speed direct current (DC) vapor compression cooling system uses electronic controls to directly connect the refrigerator's solar photovoltaic (PV) panel to its compressor. A well-insulated cabinet with generous thermal storage capacity can maintain the cool environment overnight and on days when solar power production is low. When full solar input is available again, the high efficiency cooling system and PV panel enable the efficient refrigeration system to decrease the temperature of the unit and preserve its precious stores through the heat of the day. The purpose of this invention is to provide a practical new refrigeration system using abundant solar power, independent of electric grid or battery, thereby reducing weight and lowering transportation and maintenance cost. These features will enable the refrigeration of vital vaccines, medicines, and foods in undeveloped communities that do not have routine access to electrical power and a supply of batteries. The licensee of the technology, SunDanzer, has recently received prequalification for its vaccine refrigerator under the WHO's new safety and reliability standards. The vaccine refrigerator is one of the first products to meet the new standards, an important designation for aid organizations, governments, and other entities that are the most likely purchasers of this technology.

Figure 2: The SunDanzer Solar Powered Refrigerator system

2012 Software of the Year (SOY) Competition

2012 SOY CoWinner: QuakeSim 2.0 (NPO-48579-1) QuakeSim 2.0 is a computational infrastructure that integrates remotely sensed and ground-based earthquake related data products, modeling tools, map-based interfaces, and pattern informatics for improved understanding of earthquakes. QuakeSim 2.0 makes NASA remotely sensed crustal deformation observations available to a wide range of scientists and end users by providing modeling and analysis tools in an environment that integrates all aspects of the science and end-user workflow. NASA data products include Global Positioning System (GPS) crustal deformation observations, and airborne Interferometric Synthetic Aperture Radar (InSAR) data from JPL's UAVSAR - Uninhabited Aerial Vehicle Synthetic Aperture Radar aircraft platform. QuakeSim 2.0 provides analysis tools for defining future NASA spaceborne InSAR missions and provides the infrastructure for maximizing the utility of such future mission. Pattern informatics tools identify subtle features in crustal deformation and seismicity that provide insight into earthquake fault behavior and potential. Modeling tools allow for understanding characteristics of earthquake faults, their relation to neighboring faults, and motions of fluids in reservoirs. Interfaces to data products and mapping tools allow for exploration of the data either within the QuakeSim environment or with other tools by download. QuakeSim tools and products are used for a wide range of purposes. Current purposes include improving new versions of the Uniform California Earthquake Rupture Forecast, setting of earthquake insurance rates by the insurance industry, modeling GPS and interferometric radar data, earthquake response, and assessing the hazards of related tsunami propagation.

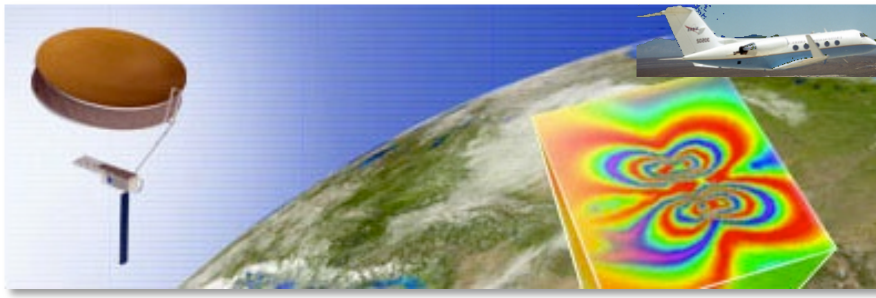


Figure 3: QuakeSim uses data from space, aircraft, and earth based deformation measurement systems.

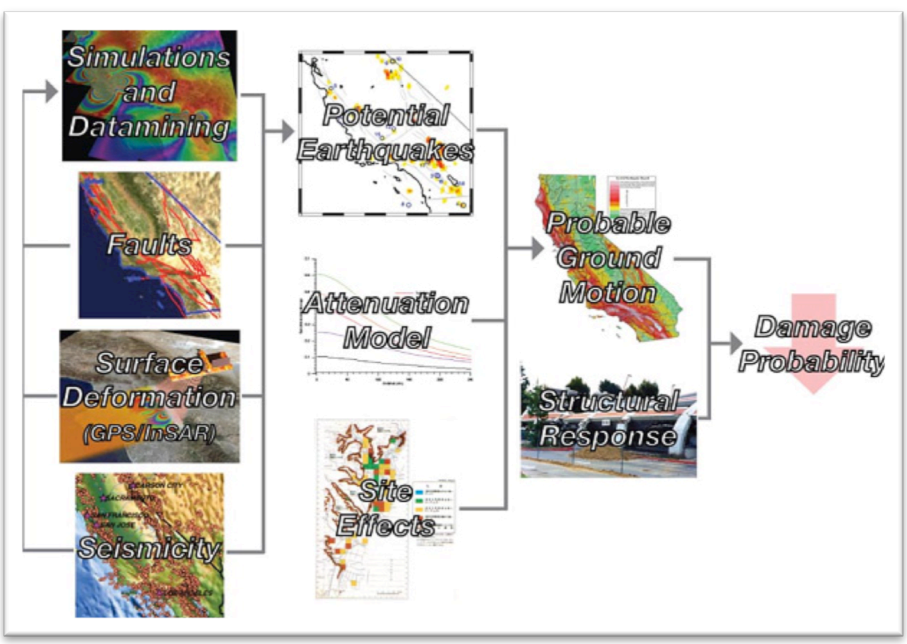


Figure 4: Quakesim has increased the accuracy of earthquake predictions fourfold.

2012 SOY CoWinner:
The NASA App (ARC-16325-1A)

Figure 5: The NASA App gathers, aggregates and optimizes information to mobile devices in an efficient and user friendly way.

The NASA App streamlines the discovery of NASA's best research through the popular medium of the mobile device. Users of devices like the iPhone, iPod touch, iPad, Android phones and tablets can now easily access a wealth of NASA content, including thousands of images, videos on-demand, feature stories, breaking news, mission information, ISS Sighting opportunities, Earth orbiting satellite trackers, live streaming of NASA Television, the agency's Third Rock online radio station, current launch schedule and featured content. Information is delivered to the NASA App through the mobile optimized backend, that initially comes from non-mobile friendly sources.

The information comes from websites, databases, Really Simple Syndication (RSS) feeds, JavaScript Object Notation (JSON) feeds, Extensible Markup Language (XML), etc. All this information is collected, aggregated, optimized for mobile devices, and kept up to date by a collection of automated scripts and dedicated databases. These automated scripts run constantly to gather new NASA content, add in their related metadata and store for mobile use. For example, images in the app are part of this backend collection. Once an automated script finds a new image (from RSS/JSON feeds or by scraping the info from web pages directly), it gets the path to the full size image plus all of the related meta data and downloads it in the highest quality available. The image is then saved in several image depths, resolutions, bit sizes, etc. to match the most common mobile screen sizes. The NASA App then automatically chooses the correct size for the users screen and downloads it accordingly. This makes for excellent image viewing and since the mobile device doesn't have to do any post processing, this method greatly increases performance. So far, over 157,000 images have been cataloged by the NASA App and tailored for display on mobile devices. Another innovation in the app was the addition of the International Space Station and Earth-orbiting-satellite tracking maps with overlays of ground tracking station lines on a Google map. There was no ready way to do this, so the team developed a system to automatically gather the appropriate two line element (TLE) files for the satellites and then map the overlay view's coordinate points to the coordinate points in the map view. They then used this new view as a container for moving the orbiter icon, painting the ground station lines on the screen and displaying other items. To enhance the satellite tracking maps, the team also added the ability to look up the current visible passes for the ISS either using the GPS on the device or with a location provided by the user. Once the location is obtained, a table of over 4,000 possible locations is queried in the NASA App backend to pinpoint the nearest possible location. Then this location is used to automatically query the Human Space Flight (HSF) real time data at NASA's Johnson Space Center and return the correct visible passes for the user's location. The passes are then displayed on the users screen in a sorted table that also includes a working compass so the user can identify the starting location of the visible passes. The visible passes are also easily shared with a single tap.

More ICB Exceptional Cases…

The ICB regularly recognizes Exceptional contributions beyond those entered in the yearly competitions. The following awards were also designated as Exceptional:

Spatial Standard Observer (ARC-14569-1)
The Spatial Standard Observer (SSO) was Ames Research Center's Invention of the Year nomination for the 2011 competition. It is an artificial perception system designed to imitate how humans perceive visual anomalies. Based upon extensive measurement of human spatial sensitivity, it computes a measure of the perceptual intensity of an image, or of the difference between two digital images. The SSO has application in a wide variety of processes: digital imaging, display design, image quality evaluation and optimization, specifying industrial standards for visibility, graphic design. It will be useful in any application requiring measurement or specification of visual intensity of spatial patterns.

Initially developed as a tool for design, specification, and inspection of visual displays, it includes a software algorithm that incorporates a simple model of human-visual sensitivity to spatial contrast for use in a wide variety of display inspection and measurement applications. Spatial Standard Observer automates the ability to automatically measure mura (blemishes) in flat panel displays, improving the efficiency of automated manufacture of large flat-panel displays and thus lowering their cost. The tool is also being applied to a wide range of aerospace problems, including visibility of UAVs, legibility of fonts, and discriminability of cockpit symbols. NASA U.S. and foreign patents have been filed.

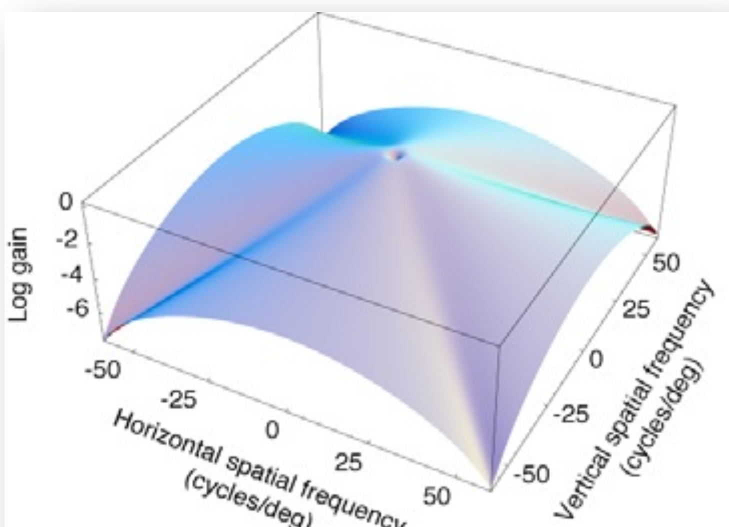


Figure 6: This system mimics human perception of visible defects for the automated inspection of flat screen televisions after production.

Extreme Low Frequency Acoustic Measurement Portable System (LAR-17317-1)

This innovation is a small and portable low frequency (DC through 20 Hz) acoustic measurement system. The low frequency signatures have unique capabilities of traveling hundreds of miles without attenuation and have numerous applications ranging from aviation safety, subterranean, seismic, and environment detection. This is the first portable system of capable of separating low frequency sounds of interest from varied low frequency background noises. The capability of detecting a specific low frequency noise apart from other masking noises has applications such as upper atmosphere sonic boom detection, prediction of tornados, hurricanes, and security breaches. The key elements of the invention include a low-frequency microphone with especially low background noise, which enables detection of low-level signals within a low-frequency passband. The second component is a data acquisition system that permits real-time detection, location, and bearing of the origin of the sound. The system is licensed to PCB Piezotronics Inc. for commercialization.

Figure 7: This microphone system successfully separates events of interest, such as distant sonic booms, from common low frequency sounds.

Composite Case Armor (LEW-17954-1)
High performance aircraft jet engines use titanium blades to raise the combustion temperature for greater efficiency. The engines must be able to demonstrate that, in the event of a blade detaching at high speed, the engine can contain the blade and protect the airframe. With an intact airframe, the chance of a safe emergency landing with an engine out is favorable. This innovation is a three-layer armor design for the containment of titanium jet aircraft engine blades during an engine incident. The inner layer of armor, bonded to the inner diameter of the composite case, more uniformly distributes the point load of the pointed projectile into the composite structure. This reduces the stress concentration at the impact location and better enables the underlying braided composite layer of armor to carry the impact. The braided fan case has a toughness superior to aluminum and enables significant reductions in weight and fuel consumption. The outer layer of armor, bonded to the outer diameter of the composite case, carries the hoop tensile load that accumulates during the blade-out event. The principal failure mode of the fan case during this event is a tensile failure as the released blade is slowed by the fan containment case. The orientation of this tensile load is primarily in the hoop direction and it is located in the region covered by the braided composite band. The purpose of the braided composite band is to carry most of this tensile load so that concentrated blade-out loads on the braided structural case are minimized.

Figure 8: The composite case armor allows engine limits to be raised without a weight penalty that offsets the resulting performance gains.

600 Volt "Stretched Lens Array" (SLA) for Solar Electric Propulsion (SEP) (LEW-18382-1)

By focusing light with flexible lenses, this new space photovoltaic SLA, offers >80 kW/m^3 of power to physical storage volume. Deployed, it can produce more than 300 W/m^2 areal power. With 300 W of power per kilogram of weight, SLA offers a 3-4X advantage over competing arrays in specific power. The production costs can be 75% less than planar arrays due to the use of flexible Fresnel lenses which concentrate the light to about 8X the intensity. This reduces solar cell area, mass, and cost. SLA's small cell size (85% less cell area than planar high-efficiency arrays) also allows super-insulation and super-shielding of the solar cells to enable high-voltage operation and radiation hardness in the space environment, which can save NASA >$10 billion for lunar exploration cargo transportation. In Phase II, NASA partners Entech and Auburn will perform critical ground tests, including an advanced solar concentrator (1 kW, 600 V, color-mixing lenses, multi-junction cells) direct-driving a Hall-effect electric thruster, and SLA/thruster plume interaction tests. After Phase II, SLA for SEP technology will be ready for flight testing.

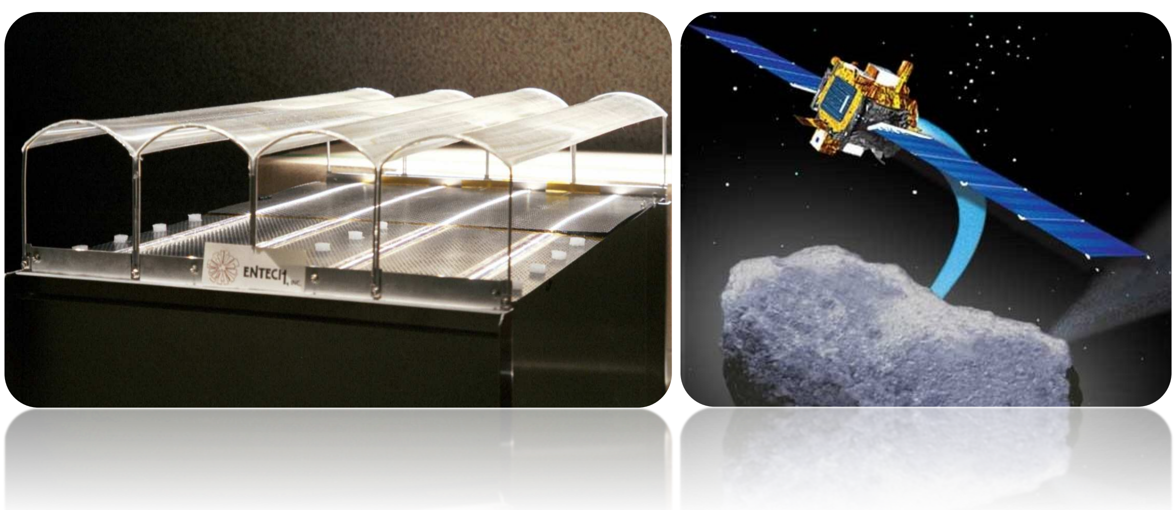


Figure 9: The Stretched Lens Array (SLA) concentrates light onto photocells to increase the distance at which solar powered thrusters on space vehicles can operate from the sun.

Phase/Matrix Transformation Weld Process and Apparatus (MFS-31559-1-DIV)

This process allows for faster welding of large welds typically found in aerospace applications such as spacecraft bodies, fuel tanks, and aircraft fuselages. In addition, this process allows for the welding of dissimilar materials which provides for the increased incorporation of lightweight materials essential to efficient aerospace operations. This method results in stronger welds better able to withstand the large forces inherent in spacecraft launch and high pressures. It includes heating the first and second elements to form an interface of material in a plasticized or melted state interface between the elements. The interface material is then allowed to cool to a plasticized state if previously in a melted state. The interface material is then mixed while in the plasticized state using a grinding/extruding process, to remove any dendritic-type weld microstructures introduced into the interface material during the heating process.

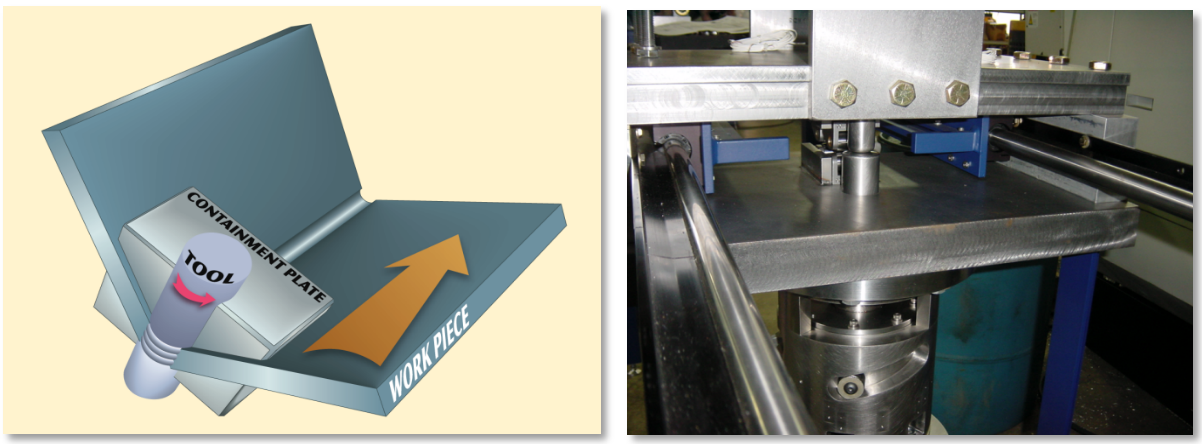


Figure 10: Materials to be joined are heated to near melting point then mechanically mixed together to fuse them.

MSC-24164-1 Methods For Growing 3D Tissue-Like Assemblies (TLA) Of Human Broncho-Epithelial Cells

Researchers at Johnson Space Center have engineered tissue samples in a simulated microgravity environment in order to mimic the characteristics of in vivo human tissues method for producing *in vitro* three-dimensional (3D) human broncho-epithelial TLA's for use in research of human respiratory virus infections. The TLA's mimic aspects of the human respiratory epithelium, allowing for the creation of realistic experimental conditions of viral lung disease without infecting human subjects. The JSC innovation provides the morphology, cell-to-cell interactions, and cell-to-matrix interactions characteristic of human respiratory epithelia that are lacking in traditional two-dimensional (2D) models.

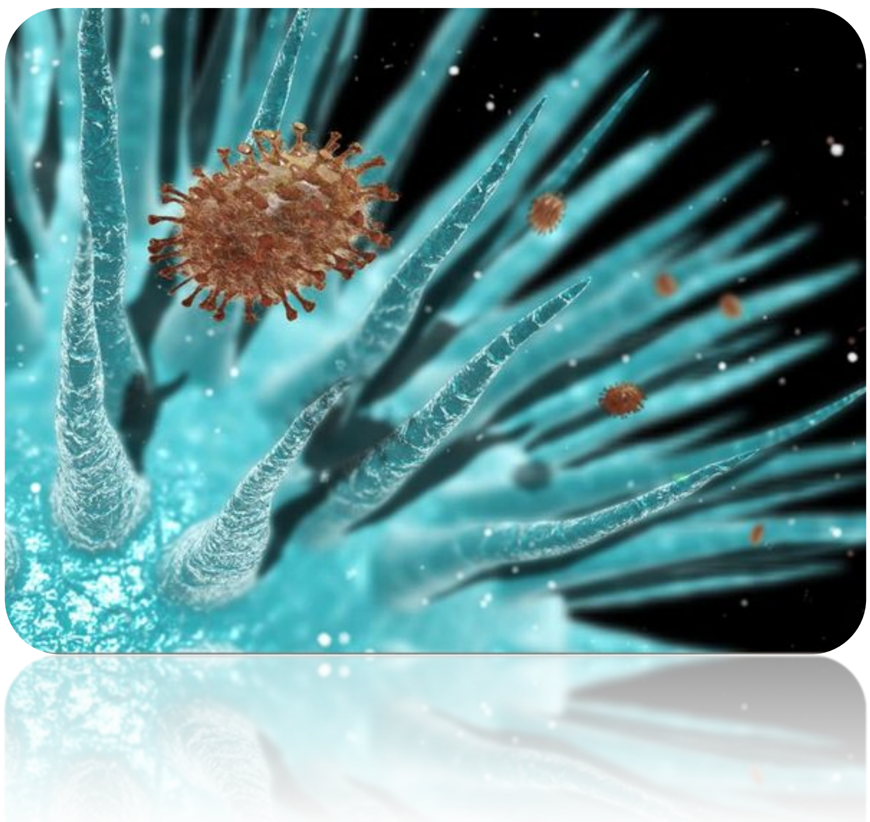


Figure 11: Microscopic view of the human flu virus on lung tissue

ICB Spotlight: The path of inventions to the Mars Science Laboratory (MSL)
by Dr. Christopher H. Jaggers, JPL Awards Liaison Officer

The current Mars Science Laboratory (MSL) mission relies heavily on technology innovations for success. Many of these innovations can be traced back to prior rover missions to Mars (Mars Pathfinder, 1997; Mars Exploration Rovers, 2003), while the MSL mission has also required the development of new technologies. These significant contributions continue to be identified and recognized by the ICB through the NASA Space Act Awards Program.

The Rocker Boogie Suspension System (Board Award, 2006), first found use on the Mars Pathfinder mission, is the basis for the ground suspension system found on the Curiosity Rover.

Figure 12: Rocker Boogie Suspension System, awarded by the ICB in 2006

The Autonomous Exploration for Gathering Increased Science (AEGIS) software (NASA Software of the Year, 2011) was first used by the Mars Exploration Rover (MER) Opportunity and will be incorporated into the MSL operations software in early 2013. The MSL flight software takes its roots from the MER flight software (Board Award, 2007) but has been significantly enhanced due to the increased complexity of the MSL mission. The advanced robotics and autonomous navigation capabilities on the Curiosity rover are the result of many years of development at JPL and has been the subject of numerous Board Awards over the past 10+ years. To date, the Mars Science Laboratory mission has resulted in the creation of over 130 new innovations (represented by the filing of a new technology report, or NTR). This number should climb as innovators continue to document their contributions and new innovations are made in support of mission operations. These innovations include the significant improvements of existing technologies (evolutionary) as well as the creation of game-changing technologies (revolutionary).

One of the most significant innovations is the MSL Skycrane Landing System, which was critical to landing the Curiosity rover and is expected to influence future NASA missions which require landing a large payload on a planetary body. It is anticipated that these innovations will result in a number of NASA Space Act awards in the near future.

Figure 13: The Skycrane Landing System

The Mars Science Laboratory mission is one of many missions that leverage both existing or legacy technologies as well as the development of new technologies for success. In keeping step with these innovations, the NASA Inventions and Contributions Board will continue to identify, recognize and reward these significant contributions to NASA's mission.

For information on ICB activities from previous years, we encourage you to visit the ICB website on the NASA Engineering Network at http://icb.nasa.gov.

The 2012 Board and Staff: Recognizing the Inventors
The Inventions and Contributions Board members are nominated by their home Field Center and approved by the Administrator before joining the ICB. They are technical experts in fields spanning the Agency. They perform the function in addition to their normal workloads without funding from the ICB. For 2012, the ICB was pleased to have the following membership:

ICB Members:
Dr. Michael G. Ryschkewitsch, Chair and NASA Chief Engineer
Dr. Donald C. Braun, GRC, Vice Chair
Ms. Helen M. Galus, Counsel to the Board, HQ
Dr. G. Dickey Arndt, JSC
Dr. Biliyar (Bil) N. Bhat, MSFC
Mr. John O. Bristow, GSFC
Ms. Sandra A. Cauffman, GSFC
Mr. Donald O. Frazier, MSFC
Mr. John E. James, JSC
Dr. Dochan Kwak, ARC
Mr. David C. McComas, GSFC
Mr. Richard McGinnis, HQ
Dr. Mary Ann Meador, GRC
Dr. Christa D. Peters-Lidard, GSFC
Dr. Jacqueline (Jackie) W. Quinn, KSC
Mr. Robert T. Savely, JSC
Dr. Upendra N. Singh LARC
Dr. Leland (Lee) S. Stone, ARC
Dr. Rheal (Ray) P. Turcotte, LARC
Ms. Caroline K. Wang, MSFC
Dr. Robert (Bob) C. Youngquist, KSC

ICB Headquarters Personnel:
Mr. Anthony (Tony) J. Maturo, ICB Director
Mr. Jesse C. Midgett, ICB Chief Technologist
Ms. Iona Butler, Program Support Specialist
Ms. Patricia E.J. Williams, Staff Specialist

The 2012 Software of the Year (SOY) Advisory Panel: Augmenting the ICB

A special Software Advisory Panel reviews nominations for the SOY Competition, obtains clarification where needed, and forwards the additional information to the ICB. The software experts on this panel are from across NASA and are nominated by the NASA field centers to assist the ICB.

Anthony R. Gross (ARC)
Phillip W. Hebert (SSC)
John C. Kelly (HQ)
Stuart A. Leven (HQ)
William L. Little (KSC)
Alfred T. Mecum (GSFC)
Jesse C. Midgett (LaRC)
Herbert W. Schilling (GRC)
Tomas J. Soderstrom (JPL)
Roger A. Truax (DFRC)
Lynn R. Vernon (JSC)
Martha S. Wetherholt (HQ)
Felicia M. Wright (LARC)

The 2012 Awards Liaison Officers: Invention Award Facilitators

The Awards Liaison Officers (ALO's), Patent Counsels and Attorneys, and technology transfer and software release authority personnel at each Field Center are involved in the award identification process. The ALO's must do the necessary legwork to locate inventors, collect their contact information, and submit them to the ICB throughout the year. All ICB award submissions must be coordinated with one of the Center ALO's below.

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2012 ICB Annual Report Acronym List

2D: Two Dimensional
3D: Three Dimensional
AEGIS: Autonomous Exploration for Gathering Increased Science
ARC: Ames Research Center
ALO: Awards Liaison Officer
C: Celsius degrees
DC: Direct Current
DFRC or DRC: Dryden Flight Research Center
DIV: Divisional Patent suffix
EDT: Eastern Daylight Time
F: Fahrenheit
GPS: Global Positioning System
GRC: Glenn Research Center
GSC or GSFC: Goddard Space Flight Center
GUI: Graphical User Interface
HQ: NASA Headquarters
Hz: Hertz (cycles per second)
ICB: Inventions and Contributions Board
InSAR: Interferometric Synthetic Aperture Radar
IOY: NASA Invention of the Year
IPOEF: Intellectual Property Owners Educational Foundation
ISS: International Space Station
JSON: JavaScript Object Notation
JPL: Jet Propulsion Laboratory
JSC: Johnson Space Center
KSC: Kennedy Space Center
kW: kilowatt= 1000 Watts of electrical power
LaRC/LAR: Langley Research Center
LEW: Glenn Research Center (formerly Lewis Research Center)
MER: Mars Exploration Rover
MSC: Johnson Space Center (formerly Manned Spaceflight Center)
MSFC or MFS: Marshall Space Flight Center
MSL: Mars Science Laboratory (Curiosity Rover)
MSR: Mars Sample Return
NACA: National Advisory Committee on Aeronautics
NASA: National Aeronautics and Space Administration
NEN: NASA Engineering Network
NPO: Jet Propulsion Laboratory (formerly NASA Pasadena Office)
NTR: New Technology Report
OCE: Office of the Chief Engineer
OCIO: Office of the Chief Information Officer
OCT: Office of Chief Technologist
OGC: Office of the General Counsel

OSMA: Office of Safety and Mission Assurance
PV: PhotoVoltaic
RSS: Really Simple Syndication
SDK: Software Development Kit
SEP: Solar Electric Propulsion
SLA: Stretched Lens Array
SOY: NASA Software of the Year
SSC: Stennis Space Center
SSO: Spatial Standard Observer
STS Space Transportation System
TCP/IP: Transmission Control Protocol/ Internet Protocol
TLE: Two Line Element
UAVSAR: Uninhabited Aerial Vehicle Synthetic Aperture Radar
V: Volt
W: Watt
WHO: World Health Organization
XML: Extensible Markup Language
www.nasa.gov: the World Wide Web location for the NASA Government operated website

Credits

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