

Public Written Comments Submitted to PCAST

from July 8, 2010 to August 24, 2010

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From: "Joe Carson" <jpcarson@tds.net>

Date: Sat, July 10, 2010 4:33 pm

To: "Stine Deborah D." <Deborah_D._Stine@ostp.eop.gov> (more)

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July 10, 2010

Dr. James Gates, Chair
STEM Education Subcommittee
President's Counsel of Advisors on Science and Technology (PCAST)

Via: Deborah Stine, Executive Director, PCAST

Re: Public Comments for PCAST meeting of July 16 about "Vols4STEM" opportunities and obstacles

Dear Dr. Gates,

Per the Federal Register Notice of June 23, 2010, I provide the following public written comments about "Vols4STEM" <www.vols4stem.org>.

Vols4STEM is an open-source community resource of the greater Knoxville-Oak Ridge Tennessee area with a functional purpose - to facilitate the intentional, voluntary, collaboration of an area's STEM professional community, STEM employers, STEM educators, and other stakeholders to improve K-12 STEM education and workforce development, primarily by getting more STEM professionals engaged, as volunteers, in STEM-related outreach activities to area youth.

My wife, Karen Carson, was elected to the Knox County, TN School Board in 2004. In late 2006, I sought and received a mandate from the Knoxville Chapter of the Tennessee Society of Professional Engineers (TSPE) <www.tnspe.org>, to represent it in leading an effort to create what has become Vols4STEM. (TSPE is a State Society of the National Society of Professional Engineers (NSPE) <www.nspe.org>).

At this point in time, Vols4STEM and Knox County Schools, are the defacto "gold standard" for the following objective:

"Facilitating the intentional, voluntary, collaboration of an area's STEM professional community, STEM employers, STEM educators, and other stakeholders to improve K-12 STEM education and workforce development, primarily by getting more STEM professionals engaged, as volunteers, in STEM-related outreach activities to area youth."

This is because no other school system has this specific objective in its strategic plan and no other community is developing a resource as Vols4STEM to help facilitate its accomplishment.

My efforts are motivated, in essential part, by my desire to uplift and advance my profession of engineering, its code of ethics, and service to society. Vols4STEM is, in a sense, a manifestation of the NSPE "Code of Ethics for Engineers," which states, in Section III.2.a <www.nspe.org/Ethics/CodeofEthics/index.html>:

"Engineers are encouraged to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community."

However, for Vols4STEM to become a viable tool/community resource, it has to advance objectives of diverse stakeholders. As long as their objectives do not conflict with those of the engineering profession and its code of ethics, successful collaboration to advance the common objective is possible (and desirable). In retrospect, though, I think "Pioneers4STEM" would have been a better name, because this has been (much) longer and harder than I, and TSPE, expected!

So what to the objectives of the PCAST STEM Education Subcommittee?

Well, I desire its validation - that the objective for which Vols4STEM is an instrumental tool is both feasible and desirable. If not ,why not? If so, then how can the PCAST use its influence to help Vols4STEM become a viable tool to advance that objective?

If the PCAST wants to do something, then I suggest it recommend to President Obama that he direct federal agencies with science and technology missions and significant field facilities (i.e. Department of Energy, NASA, Department of Defense, etc) establish policy by which they would, without spending any taxpayer money, encourage relevant stakeholders in those host communities to adopt the same (or similar) objective Vols4STEM exists to advance.

Why do I suggest this? After informally suggesting, for several years, that the Department of Energy (DOE) in Oak Ridge, Tennessee (where I am employed) establish such a policy, I recently I submitted a formal employee suggestion for this (attached). I was informed: 1) DOE no longer has a formal employee suggestion program, and 2) DOE appears to be either legally or fiscally constrained from adopting my suggestion. Because DOE no longer has a formal employee suggestion program, this process has been ad hoc, so my current understanding may not be the final word.

I bring this to your attention as it seems rather inconsistent with what President Obama, Secretary of Energy Chu, Secretary of Education Duncan, OSTP Director Holdren, etc say. After approaching 4 years at this effort, I do not see how it would require any taxpayer money for the Department of Energy - in Oak Ridge or elsewhere - to establish such a policy - and I can assure you, based on many conversations with relevant stakeholders, that its doing so would significantly advance its accomplishment.

Respectfully,

s/
Joe Carson, PE
10953 Twin Harbour Drive
Knoxville, TN 37934

Attachments:

this letter in pdf format

My related formal employee suggestion to DOE, which I (now) understand has been rejected as too costly and/or not legally permissible, but it has not received a formal response, because DOE no longer has a formal employee suggestion program.

May 2010 article for "PE" magazine, the NSPE monthly publication, about the role Vols4STEM played in placing over 500 Knox County STEM teachers with area employers for an "in-service" day.

June 24, 2010

Ms. Patrica Howse-Smith, Director
Human Resources Division, Oak Ridge Office
Department of Energy
Oak Ridge, TN
<howsesmithp@oro.doe.gov>

Subject: Employee Suggestion, per DOE Order O 331.1B, Employee Performance Management System - "Making Vols4STEM < www.Vols4STEM.org> a national model for host communities of federal facilities with science and technology missions "

Dear Ms. Howse-Smith,

This replaces my employee suggestion of June 15 to reflect that DOE Order O 331.1B includes provisions for DOE employees to submit employee suggestions and for those suggestions to be evaluated for awards.

Background:

Science, Technology, Engineering, and Math (STEM) education, including grades K-12, is part of DOE's mission < http://www.scied.science.doe.gov/scied/sci_ed.htm>. DOE's Office of Science contains an Office of Workforce Development for Teachers and Scientists.

The President's Council of Advisors for Science and Technology (PCAST) has a STEM education subcommittee <<http://www.whitehouse.gov/administration/eop/ostp/pcast/about>>.

The October 22-23, 2009 meeting of the PCAST contained a review of "Federal STEM Education Initiatives" as which Bill Valdez, Director of the Office of Workforce Development for Teachers and Scientists, made a presentation <<http://www.whitehouse.gov/files/documents/ostp/PCAST/Valdez.pdf>>.

Vols4STEM is, at this point, the (by default) national model for a community resource to facilitate the intentional, voluntary, collaboration of an area's STEM professional community, STEM employers, STEM educators, and other stakeholders to improve K-12 STEM education and workforce development, primarily by getting more STEM professionals engaged, as volunteers, in STEM-related outreach activities to area youth. No other community has this as a specific goal, while it is part of the 5 year strategic plan of Knox County Schools.

Vols4STEM is an inclusive "open-source network" - a community resource that belongs to no one and owns nothing. It was "engineered" to be readily replicable, because the

local sections of STEM professional societies using Vols4STEM as a tool to advance their K-12 STEM outreach objectives have hundreds of sections across the Country, particularly including other DOE host communities and host communities of other federal facilities with science and technology missions.

Vols4STEM is designed to work with and add-value to existing voluntary membership associations as STEM professional societies, Chambers of Commerce, PTA's/PTSO's, trade associations, etc - it relies on networks of committed people, volunteering their time and expertise to improve their communities and, thereby, America.

Describe Present Situation:

There is no local community-based systematic way to connect STEM professionals, STEM employers, and STEM educators in a voluntary, collaborative, way to advance their common agenda of K-12 STEM education and workforce development. There is so much foregone opportunity!

DOE does not have a goal of its host communities being models of the voluntary, intentional, collaboration envisioned in Vols4STEM.

Describe Suggestion in Detail.

Vols4STEM builds on the local and national "social capital" residing in STEM professional societies, Chambers of Commerce, PTA's/PTO's, etc to connect a community's resources with STEM educators to assist their mission.

The attached documents, together with the Vols4STEM website, give elaborating detail - both for the need for a tool as Vols4STEM and how it is coming together.

What is Missing and what I hope this suggestion accomplishes:

DOE has not used its convening authority in this area to validate the objectives of Vols4STEM and encourage the growth and utility of the Vols4STEM network. DOE has not adopted Vols4STEM objective as its own for its host communities - that they become models of the voluntary, intentional collaboration of an area's STEM professional community, STEM employers, STEM educators and other stakeholders in improving K-12 STEM education and workforce development. Also, DOE is not using PCAST to advocate that other federal agencies with science and technology mission and field facilities (i.e. NASA, DOD, NIH) establish such a goal for their host communities.

On the other hand, I understand Secretary Chu has directed policy be developed for encouraging DOE/DOE contractor STEM professionals to get more involved, as

volunteers, in STEM outreach activities (his recent email to DOE employees soliciting support for National Lab Day is attached) . If so, this suggestion could build on such a policy, by encouraging DOE and its contractors actively engaging and building upon on existing social capital and community resources in their host communities in an open, voluntary, collaborative manner.

DOE Order O 331.1B, "Employee Performance Management System," section 5(c)(5), may apply to this suggestion given its inter-agency scope.

Respectfully,

s/

Joe Carson, PE

Facility Representative (EM-972)

Oak Ridge, TN

865-576-1478 <carsonj@oro.doe.gov>

Knoxville Chapter of Tennessee Society of Professional Engineers <www.tnspe.org >

representative to Vols4STEM Steering Committee

-----Original Message-----

From: DOECAST

Sent: Friday, May 07, 2010 1:56 PM

To: ORO Federal Employees; OSTI Data Control; IG-36 Distribution List; PNSO

Federal Employees; SLAC Federal Employees; TJSO Distribution List

Subject: National Lab Day

Dear Colleagues,

I write to encourage all of you to take part in National Lab Day - a grassroots initiative to reinvigorate science and math education in our nation's schools and after-school programs.

To those of us who work at the Department of Energy, the name can be a little confusing. This is not about our National Laboratories -- although many staff and contractors from our labs are participating. It is instead a nationwide movement to inspire scientists, engineers, and other professionals to work with educators to bring hands-on science projects to students in grades K-12.

Beginning on Wednesday, May 12, scientists and engineers across the country will pair with local schools to conduct discovery-based science experiences. But this effort is bigger than just one day; it promotes hands-on learning throughout the year. I urge you

to consider lending a hand at a project in your local area, and you can find a list of projects at: <http://www.nationallabday.org/projects/live>

As you know, we need a bold new generation of scientists and engineers to make America competitive in this century and to tackle the great challenges that we will face. This is a wonderful opportunity for all of us to make a difference in the lives of our young people and the future of our nation. I hope you will join me in helping to prepare our future scientists and engineers.

Sincerely,

Steven Chu

Recruiting Volunteers in the Volunteer State

The Knoxville chapter of the Tennessee Society of Professional Engineers has launched an Internet-based clearinghouse to connect educators; employers; and science, technology, engineering, and math professionals.

Vols4STEM is a Web site that enables STEM professionals who would like to volunteer in K-12 programs, competitions, and projects to connect with schools and other organizations that need assistance. The initiative hopes to raise money and volunteers from area employers.

Joe Carson, P.E., a member of the Vols4STEM steering committee for the Knoxville chapter, explains that a high concentration of scientists and engineers are based in the Knoxville-Oak Ridge area because of the Department of Energy's Oak Ridge office, local DOE contractors, the Tennessee Valley Authority, and the University of Tennessee. Carson's wife is on the school board in Knox County, and Carson thought there was an opportunity for area STEM professionals to become more involved in educational outreach activities.

Vols4STEM can be seen as a stool with three legs: the STEM professional community, STEM employers, and STEM educators. A number of local engineering societies, area chambers of commerce, and educational systems are already represented on the Vols4STEM Steering Committee. "[Vols4STEM is] a community resource to get more voluntary collaboration between these three legs, with the intention of improving K-12 STEM education and workforce development," he says.

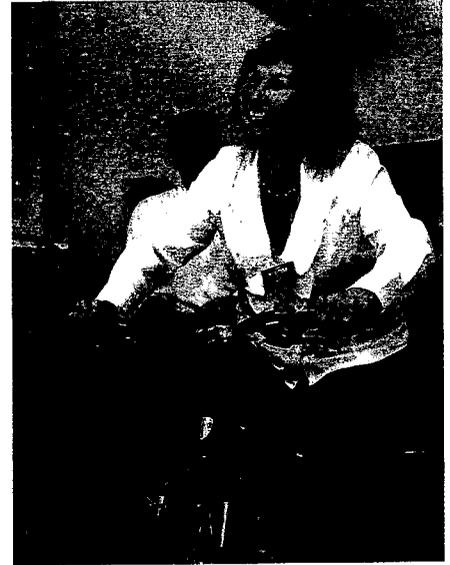
The Web site enables volunteers to search for available programs and educators to find outreach activities. Carson explains that the site also lets volunteers register, although area STEM professional societies are also expected to contact their members for help when opportunities matching their interests arise. "It's a belt and suspenders approach," he says.

The steering committee has raised and invested about \$10,000 in the Web site and is working with the local Chamber of Commerce to attract area employers, both as financial sponsors and sources of volunteers.

On April 5, Vols4STEM also sponsored an in-service day in which 500 math and science teachers from Knox County schools visited 33 area STEM employers to learn about their job tasks.

"We hope that [the Vols4STEM initiative] is a prototype that can be expanded to chapters across the country," says TSPE executive director Candy Toler. While TSPE has been promoting outreach activities for many years, "the Knoxville chapter's commitment to outreach took a giant step when it began the creation, promotion, and coordination of the Vols4STEM program and recruiting volunteers for the endeavor."

Visit www.vols4stem.org.



A FARRAGUT MIDDLE SCHOOL TEACHER PARTICIPATES IN AN ENERGY EXPERIMENT AT THE Y-12 NATIONAL SECURITY COMPLEX IN OAK RIDGE, TENNESSEE. THE IN-SERVICE DAY FOR TEACHERS WAS SPONSORED BY VOLS4STEM.

NICET Launches Salary Survey

The National Institute for Certification in Engineering Technologies, a division of NSPE, is conducting a salary survey to gather information on market trends, rates, and ranges of benefits and services.

NICET encourages those working in the engineering technology field to participate in order to help determine fair and reasonable compensation for technicians and technologists. The survey will take about 10 minutes to complete, and all participants will receive a complimentary summary of results.

Topics include state and region of employment, salary, benefits package, years of experience, education level, and professional development.

In addition to the summary of results, NICET is offering participation incentives such as one continuing professional development point toward NICET recertification

and random biweekly giveaways, such as gift cards, NICET store items, and waived NICET base recertification fees. Individuals who identify themselves on the survey as a PE may be eligible for trial or discounted membership rates in NSPE.

NICET last conducted a salary survey in 2006, in conjunction with the American Society of Certified Engineering Technicians. It garnered about 3,000 responses. As of the beginning of April, almost 4,000 responses have been received in this year's survey.

The survey launched in February and will remain open until June 30th, with results released mid-summer. Individuals seeking detailed or customized reports can purchase those from NICET.

Access the survey via the NICET homepage, www.nicet.org.

From: "Jeff Bobbi Carissa Woytach" <jbcwoytach@windstream.net>
Date: Mon, July 12, 2010 11:10 am
To: pcast@ostp.gov
Priority: Normal
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The link to the document shown below does not work. Can you please tell me where the document I submitted can be found?

Thank you.

Jeffrey Woytach

From: Whitehouse.gov [mailto:info@messages.whitehouse.gov]
]
Sent: Tuesday, June 29, 2010 7:51 PM
To: jbcwoytach@windstream.net

Subject: Form submission from: Contact Us

Submitted on 2010-06-29 19:46
Submitted by anonymous user: [174.130.35.227]

Submitted values are:

Name: Jeffrey Woytach
Organization:
Phone: 440 327 4279
E-Mail: jbcwoytach@windstream.net

Direct Your Comment: PCAST

Comment:

Please see my attached document with commentary regarding the future of NASA.

Thank you for the opportunity to share my thoughts with you.

Upload a Document:

<http://www.whitehouse.gov/sites/default/files/webform/Is%20space%20exploration%20important.rtf>

The results of this submission may be viewed
at:<http://www.whitehouse.gov/node/8778/submission/95252>

<<http://odlinks.govdelivery.com:80/track?mailingid=1277855416026&messageid=PRD-ODM-1277855416026&databaseid=1001&type=open&serial=1276628423&emailid=jbcwoytach@windstream.net&userid=1&fl=&extra=MultivariateId=&&&>>

From: rac@eastlink.ca
Date: Wed, July 14, 2010 1:36 pm
To: pcast@ostp.gov
Cc: dstine@ostp.eop.gov (more)
Priority: Normal
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Hello, I am a citizen of Canada and I support the President's FY11 budget plan for NASA!

I have done personal research into the work of space experts including the Augustine committee. I have found the President's FY11 budget plan is the BEST path forward for science and technology in the United States.

I also believe it is the best path for the PEOPLE of the United States and the world. The short term job loss is undeniable as old programs end and new programs begin.

But opponents of the plan confuse the debate with lies and false dichotomies. Keep a clear head in this debate because they constantly construct invalid arguments to justify workforce protection.

If they want to protect the workforce they should request stimulus funds and stop trying to weaken America for short term gain.

Compromising on the President's FY11 budget plan for NASA hurts America.

You dilute the good of the free world if you willingly accept government competition against entrepreneurs (government rockets), cuts to R&D (trading away national intellectual leadership) and subsidies for failure (NASA center welfare), all things the opponents of FY11 support.

Others have spoken about this. I encourage anyone interested to watch the robust intellectual support of the President's FY11 in this video by Jeff Greason, former member of the Augustine committee:
<http://www.xcor.com/video/isdc.html>

Good luck and may reason win,
RC

From: "Peter O'Connell" <poconnell39@eircom.net>

Date: Wed, July 14, 2010 3:50 pm

To: pcast@ostp.gov

Priority: Normal

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I have long supported the U.S. space programme and have recognised the great achievements of NASA.

The Presidents Space Policy, specifically the cancellation of Constellation is a major mistake. The space agency should be given continued financial support to bring about the programme of record. I believe that the President's recent decisions regarding Constellation will be viewed in future years as representing America turning its back on space.

I add my voice to others in asking that the President reconsiders the matter as a priority.

Peter A. O'Connell,
39 Allendale Avenue,
Melbourn,
Bishopstown,
Cork,
Republic of Ireland

From: "steve rappolee" <steverappolee@yahoo.com>

Date: Fri, July 16, 2010 12:04 pm

To: pcast@ostp.gov (more)

Cc: strappolee@gmail.com

Priority: Normal

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Storage and transfer of liquid helium on orbit for telescope servicing mission

Consideration should be given to conducting trade studies for transferring and storing cryogenic (liquid helium) as part of any fuel depot architecture. The Liquid Helium would be utilized for on orbit transfer to space telescopes that utilize cryogenics for cooling science instruments. AIAA could be commissioned to give this idea a look with AIAA student members participating.

Attached is a PDF document of an AIAA paper where at the bottom of the last page is the genesis of an idea that like the liquid helium for servicing I thought was mine, but have been thought of by others. The liquid helium idea was suggested back in the 1980's for a future ISS experiment. Incorporating this idea into a fuel depot is mine with help from MR Kutter on how to bring it about. The PDF document attached entitled, "Atlas Centaur Atlas Centaur Extensibility to Long-Duration In-Space Applications" is an early paper on long duration cryogenic upper stage missions and I have expanded on it as follows.

Long duration cryogenic upper stage as outer planet mission enabler with solar arrays combined with aero braking at orbit insertion

There is a shortage of RTG power sources for missions and it would be a great benefit to send more JUNO type probes to the outer planets, my idea is to use long duration cryogenic upper stages for SMD missions that use residual fuel to power fuel cells for power to the space craft while the spacecrafts solar arrays are stowed behind a aero shell. Aero braking should allow a high mass spacecraft and with the solar arrays stowed behind the aero shell should provide protection to the spacecraft during orbit insertion through the outer planet atmosphere. The upper stage separates just before orbit insertion and performs a secondary science mission (like LCROSS). The spacecraft is on battery power in till after aero braking and solar array deployment. This idea too could a subject of an AIAA mission design study with student participation. This technology once developed for both SMD and ESMD could be offered to Principle Investigators through the NASA ISTP office as a flight opportunity.

Please look for synergy's, even if very long term with NASA/DOD/commercial interests and the blue ribbon committee on nuclear waste

Proposed 4th generation reactors are claimed to have the ability to use molten

salt to burn nuclear waste along with Thorium. If this is a route that is to be investigated or becomes a recommendation of the nuclear commission then tax payer expenditures might be better coordinated if the same technology is used for a space reactor as well. The question is would it be safe to launch a molten salt reactor in an inert state (turned off) into space with nuclear waste dissolved into the inert salt as part of a space based solar power architecture? I ask that the PCAST ask for a study to see if this might be possible. Any nuclear waste used as fuel in this way and removed from the biosphere would have a portion of its launch costs paid for by the nuclear waste trust fund thus stimulating the commercial launch industry. I would suggest that the new space policy applies to the blue ribbon nuclear waste commission as guidance to possible synergies between that commission and future NASA/DOD missions

Image courtesy B. Kutter, ULA, private communication with Steven Rappolee

Thank you for your time!

And please publish as my public comments to PCAST

SRA Steven Rappolee Michigan Air National Guard, Sophomore ST Clair community college

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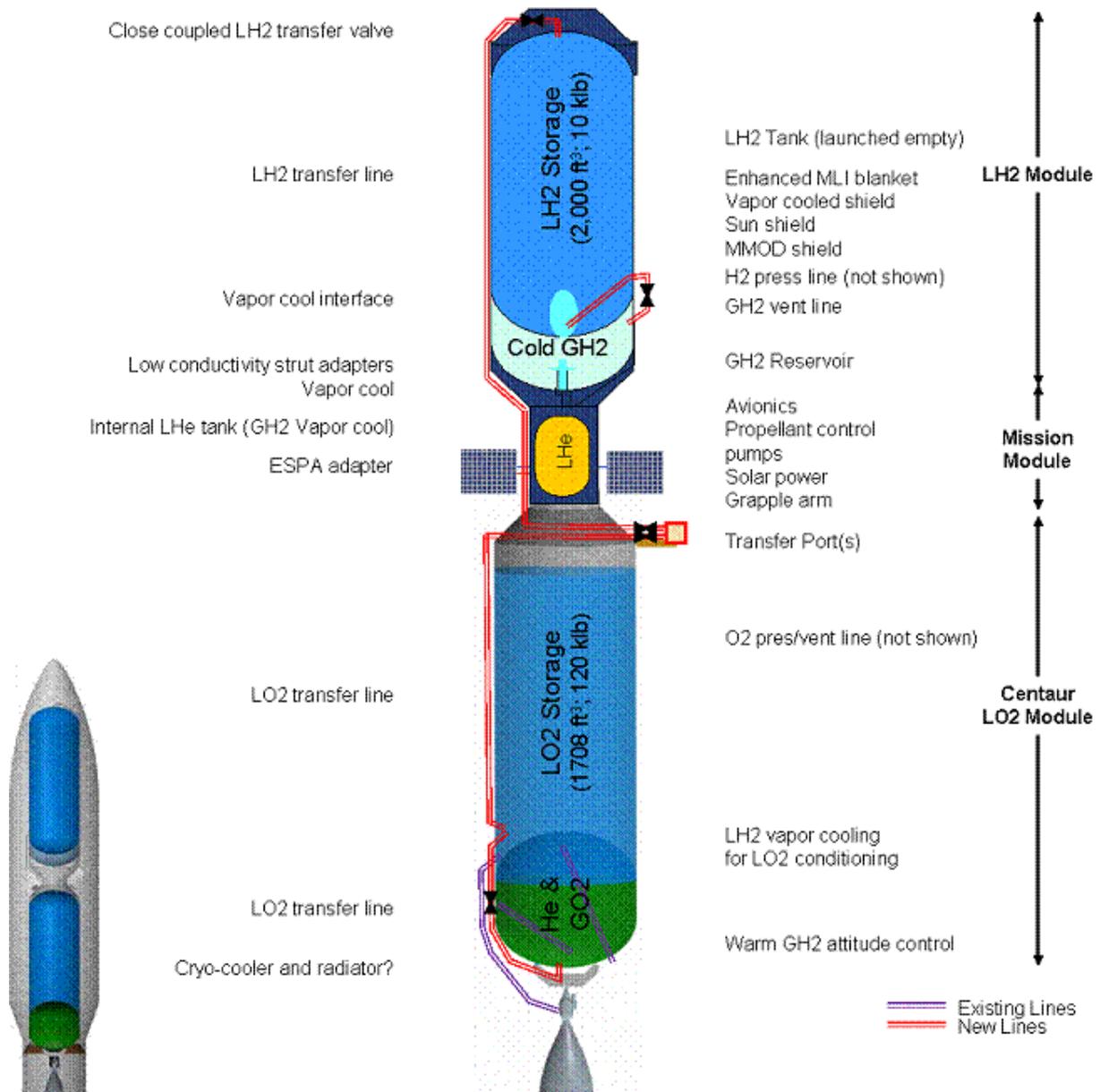


Image courtesy B. Kutter, ULA, private communication with Steven Rappolee

Thank you for your time!

And please publish as my public comments to PCAST

SRA Steven Rappolee Michigan Air National Guard, Sophomore ST Clair community college

In-Space Propulsion Technologies Minimum Demonstration Requirements for the Discovery 2010 AO

February 26, 2010

Introduction

The purpose of this document is to describe the minimum systems and activities qualifying as a flight demonstration of a NASA-developed in-space propulsion technology. Failure to meet these requirements will result in the loss of any NASA-funded incentives.

The NEXT (NASA's Evolutionary Xenon Thruster) Ion Propulsion System

The primary goal of the NEXT project was to develop key components of an ion propulsion system (IPS) for deep space science missions. The components of a typical IPS include a thruster, power processing unit (PPU), propellant management system (PMS), digital interface control unit (DCIU), and gimbal.

The minimum required hardware set for a flight demonstration of the NEXT system is comprised of the NEXT thruster and its accompanying PPU.

1. The NEXT Prototype Model (PM) ion thruster is a 6.9 kW ion thruster design that is currently at Technology Readiness Level (TRL) 6. The NEXT Prototype Model (PM) ion thruster design baseline is a required component of any demonstration, although minor design changes of the type commonly associated with the normal evolution in transitioning a PM design to a flight design are acceptable. The NASA Glenn Research Center (GRC) developed the NEXT thruster, which was fabricated by Aerojet.
2. The NEXT Engineering Model (EM) PPU is a 7kW PPU design that operates the NEXT ion thruster and will achieve TRL 6 after successful completion of environmental testing and on-going System Integration Tests (SIT) in 2010. The NEXT EM PPU circuit design baseline is a required component of any demonstration, although NASA recognizes that substantive hardware design changes may be desired, or required, to transition NEXT EM PPU to a flight design. GRC developed the NEXT thruster, which was fabricated by L-3 Communications.

The remainder of the NEXT ion propulsion system may be used for flight demonstrations but is not required:

1. The NEXT Propellant Management System (PMS) design is a highly flexible, modular design and consists of a high-pressure assembly (HPA) and low-pressure assembly (LPA). The NEXT PMS is at TRL 6, and has been tested with the NEXT thruster and PPU in the SIT. GRC and Aerojet developed the NEXT PMS.
2. The Digital Control Interface Unit (DCIU) is the electronics interface between the spacecraft computer and the rest of the IPS components. The NEXT project developed a DCIU simulator, which will not achieve TRL 6 under existing plans. ISPT also funded a separate development task called Standard Architecture that has matured a DCIU that would work with NEXT to a breadboard-level design. This task

has also matured the associated software to operate the DCIU. The ISPT-developed DCIU breadboard design and software from this task are available upon request. However, if the ISPT-developed DCIU breadboard design and software are used, then the additional cost, schedule, and technical risks for developing the ISPT-developed DCIU design and software into a flight design would be borne by the proposal team. Aerojet developed the NEXT DCIU simulator. JPL is developing the Standard Architecture DCIU breadboard and software.

3. The gimbal is the mechanical interface between the ion thruster and the spacecraft that can articulate the thrust to maintain the thrust vector pointing through the spacecraft center-of-gravity. The NEXT project developed a gimbal design that completed vibration tests to achieve a TRL 4-5. Remaining environmental tests require spacecraft-specific definition and will not be performed under the ISPT program. The ISPT-developed gimbal design will be available upon request, but the additional cost, schedule, and technical risks for developing the ISPT gimbal into a flight design would be borne by the proposal team. JPL and ATK developed the NEXT gimbal hardware.

The (AMBR) Advanced Material Bi-propellant Rocket

A primary goal of the AMBR project was to design and test an iridium/rhenium (Ir/Re) combustion chamber in an Earth storable bipropellant apogee-class engine. The AMBR engine consists of an injector, a combustion chamber and other nozzle hardware. It is based on the RD-4 HiPAT heritage design and is at TRL 6. The AMBR was developed by Aerojet.

Since a major goal of the AMBR project was to develop the iridium/rhenium EI-form fabrication process, ***the minimum required hardware to be demonstrated is a combustion chamber fabricated using this process.*** Alternate injector designs, which would improve performance over the existing AMBR injector design, would be considered acceptable. However, the additional development, cost, schedule, and technical risks to bring this alternate injector design to TRL 6 would be borne by the proposer. Additionally, although the AMBR engine was designed for the baseline fuel/oxidizer combination of hydrazine/nitrogen tetroxide (N₂H₂/NTO), it would be acceptable to modify the AMBR engine to use the alternate fuel/oxidizer combination of monomethylhydrazine/nitrogen tetroxide (MMH/NTO). However, the additional development, cost, schedule and technical risks to bring this alternate fuel/oxidizer option to TRL 6 would be borne by the proposer.

Aerocapture

The ISPT Program has developed thermal protection system (TPS) materials and structures, models for aerothermal effects, engineering atmospheric models for a number of targets, and guidance, navigation, and control (GN&C) algorithms for blunt-body rigid aeroshells. Due to the diversity of specific technologies developed, there are two different types of technology demonstrations for which incentives are offered.

1. ***Missions performing a complete atmospheric entry must demonstrate one or more rigid heat shield materials matured by the ISPT program under conditions specified***

below. Although termed the “lander” option in the Discovery 2010 AO, a probe, penetrator, hopper, atmospheric sampler, Earth return entry vehicle, or delivery device to mid-altitudes is acceptable. These materials and the required demonstration conditions are:

- a. A carbon-carbon “hot structure” with Calcarb bonded to the structure interior. This material has been designed to directly take heat up to $700\text{W}/\text{cm}^2$ and is up to 30% lighter than the Genesis capsule design in cases where a backup structure is not required. This material technology is considered TRL6. *To be considered an acceptable demonstration, these materials need to be applied in a relevant heating environment (over $300\text{W}/\text{cm}^2$ heat flux) and the C-C and Calcarb construction must be employed. Using C-C as a secondary structure is not an acceptable modification.* To verify system performance, the structure will need to be instrumented with thermocouples. The incorporation of thermocouples into the structure will be funded by the ISPT Program.
- b. A honeycomb “warm structure”. This is a traditional honeycomb sandwich aeroshell construction, but with updated adhesives and a composite core replacing the traditional aluminum core thereby raising the maximum bondline temperature to 316 C from 250 C. This material technology is considered TRL6. This structure would need to be covered in an ablator, such as Lockheed’s high-heritage SLA-561V, for heating protection although the higher permissible bondline temperature would allow for the use of a thinner ablator. *To be considered an acceptable demonstration, the ISPT-developed adhesives and core material would be employed.* To verify system performance, the structure will need to be instrumented with thermocouples at the ablator/warm structure bondline and within the ablator. The incorporation of thermocouples into the structure will be funded by the ISPT Program.
- c. A honeycomb “warm structure” with an ablator. This heatshield system can be tailored to a wide range of applications. The warm structure has facesheets with enhanced resins and fibers, updated adhesives, and a light-weighted titanium honeycomb core. The warm structure can handle bondline temperatures up to 400 C. Sensitive payloads may need additional lightweight insulating blankets behind the aeroshell due to greater soakback from the higher bondline temperature. The ablator component of the system can be any one of a “family” of materials developed under ISPT, which all have the same constituents but in varying ratios to produce a range of densities. Both the SRAM (silicone-based) and PhenCarb (phenolic-based) materials have been applied to the warm structure using high-temperature adhesives. Ablators in the range of 17 to $32\text{ lb}/\text{ft}^3$ have been extensively arcjet tested and have been competitively selected in the past for flight opportunities. Separately, and as a system, these materials have undergone extensive laboratory, radiative, and convective thermal testing. A 2.65-meter, 70-deg sphere-cone aeroshell is currently being manufactured, and will be complete by the end of FY2010.

Similar, 1-meter aeroshells and numerous flat panels have been manufactured and successfully tested both mechanically and thermally. The system is considered TRL6 and would be applicable for heating rates up to about 450 W/cm². There have been many tests above that level, but the TRL is a bit lower for the higher-density materials. It would be the responsibility of the proposer to do the additional testing necessary to bring the higher-density materials to TRL 6. *To be considered an acceptable demonstration, these materials must be used in a forebody heat shield application, although the maximum bondline temperature need not be achieved.* To verify system performance, the structure will need to be instrumented with thermocouples at the ablator/warm structure bondline and within the ablator. The incorporation of thermocouples into the structure will be funded by the ISPT Program. Note that the honeycomb “warm structure” was developed by ATK Composite Optics in San Diego, CA., with an ablator developed by Applied Research Associates, Inc. (ARA) in Centennial, CO. The ATK/ARA partnership must be preserved (*i.e.*, an ARA ablator cannot be applied to a non-ATK structure, or vice-versa).

2. For missions not performing a complete atmospheric entry — termed the “orbiter” option in the Discovery 2010 AO — ***the minimum acceptable demonstration uses the aerocapture maneuver to decelerate by at least 2km/s in the atmosphere of a planetary body and then completely exit the atmosphere after this atmospheric passage. The vehicle must also contain some minimum instrumentation suite that will validate the Aerocapture maneuver was performed within the expected parameters.*** The post-aeropass vehicle is not limited to being an orbiter; it could perform a subsequent planetary entry, or some other function.

The ISPT Program has matured the Analytical Predictor-Corrector (APC) guidance over the past several years, by applying it in detailed systems studies to missions at Titan, Neptune, Venus, Mars, and Earth. The APC guidance performance is robust to realistic atmospheric, aerodynamic, and navigational uncertainties, and study results are documented in several publications. Most recently, a hardware-in-the-loop simulation of the Guidance, Navigation and Control system has been assembled and tested, with the APC algorithm coded in flight software. The testbed, which brings the APC algorithm to TRL 6, resides at Ball Aerospace in Boulder, CO and can be made available for simulations and trades, through ISPT.

Atlas Centaur Extensibility to Long-Duration In-Space Applications

AIAA 2005-6738

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Lockheed Martin is pursuing Centaur derivatives that will provide a common-stage supporting launch vehicle, upper-stage-applications, and the in-space/ascent/descent long-duration needs. Lockheed Martin's common-stage concept would provide efficient, robust in-space transportation, and take advantage of the high-mass fraction that is enabled by Centaur's moncoque design and its common bulkhead to minimize combined LO₂/LH₂ boil off. Lunar exploration missions that take advantage of the high Specific Impulse (sec) (ISP) of LO₂/LH₂ propulsion for in-space transportation have initial mass-to-orbit launch requirements less than half of those using traditional storable propulsion stages. Therefore, the application of long-duration LO₂/LH₂ in-space propulsion technology will result in significant launch cost savings for space exploration. We would achieve passive long-duration capability by implementing cross cutting Cryogenic Operation for Long Duration (COLD) technologies, and improve cryogenic storage capability by more than two orders of magnitude compared to existing large-scale flight-proven systems. Using a common stage for launch-vehicle upper stage and in-space operations reduces development and recurring costs while providing the high-flight rate needed to achieve the demonstrated high reliability required for crewed space exploration.

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Acronyms

CATS	Centaur Aft Thrust Structure
CEV	Crew Exploration Vehicle
COLD	Cryogenic Operation for Long Duration
EDS	Earth Departure Stage
g	Earth's Gravity
GSO	Geo-Stationary Orbit
GTO	Geosynchronous Transfer Orbit
ICES	Integrated Cryogenic Evolved Stage
IMLEO	Initial Mass in Low Earth Orbit
ISP	Specific Impulse (sec)
ISRU	In situ Resource Utilization
LAD	Liquid Acquisition Device
LEO	Low Earth Orbit
LOI	Lunar Orbit Insertion
LSAM	Lunar Surface Ascent Module
MF	Mass Fraction
M_f	Final Mass
M_i	Initial Mass
MLI	Multi Layer Insulation
MPK	Mission Peculiar Kit
M_s	Stage Mass
M_{pl}	Payload Mass
M_{prop}	Propellant Mass
PMD	Propellant Management Device
PPMS	Propellant Positional Management System
SM	Service Module
SS	Sun Shield
TEI	Trans Earth Injection
VCP	Vapor Cooled Point
VDMLI	Variable Density Multilayer Insulation
VIP	Vacuum Insulation Panels
VJ	Vacuum Jacket
ΔV	Change in Velocity

I. Space Exploration Transportation Requirements

Exploration of the Moon, Mars, and beyond will require multiple in-space transportation components. The Apollo program used the following five distinct in-space stages to send humans to the moon, (fig. 1).

- 1) Saturn S2 (upper stage)
- 2) Saturn S4B (Earth Departure Stage)
- 3) Service Module (lunar Orbit insertion)
- 4) Lunar descent module
- 5) Lunar ascent module
- 6) Service module (Trans Earth injection).

Each of these stages was unique, requiring its own development, support, and infrastructure. Uniquely designed to support the Apollo mission, none of these stages were suited to support other missions, such as Earth to orbit, or mid-latitude lunar exploration; let alone missions to Mars.

Over the course of the Apollo program's seven lunar missions, a total of approximately 10 to 20 of each of the stages were built, including development launches. Developing the large infrastructure required for each of the stages, and supporting this extremely limited production run resulted in exceedingly high-unit costs.

A. Sustainable Exploration Requires a Common In-Space Transportation Approach

For the present Space Exploration program to be sustainable and extensible⁸ to NASA's exploration goals, NASA must diverge from Apollo's dedicated mission-specific design approach. A robust exploration program requires a transportation system that is flexible enough to accommodate wide-ranging mission requirements.

A common in-space transportation stage that can fulfill most, if not all of the exploration mission needs, (fig. 2), will significantly reduce the cost of exploration. Developing a single, common-exploration stage reduces the required near-term investment by eliminating five of the potential six-stage development programs. At the cost of more than \$1 billion per stage development, this common stage has the opportunity to reduce NASA's near-term transportation investment by many billions of dollars. This will enable NASA to dedicate more investment on the unique, lunar science and exploration aspects of the nation's vision.

Commonality of the in-space stage with the upper stage of a launch vehicle launching other NASA, DoD, and commercial payloads can result in stage-production rates of approximately 25 units per year, (fig. 3). This high-production rate provides for efficient low-cost production, and allows the fixed costs to be spread across numerous users, thus benefiting the entire user community. This large user base also provides NASA the flexibility to accommodate changing priorities without being anchored to a NASA-only transportation system that may not meet changing mission priorities.

⁸President Bush's stated objective of the Space Exploration mission is to be both sustainable and extensible.

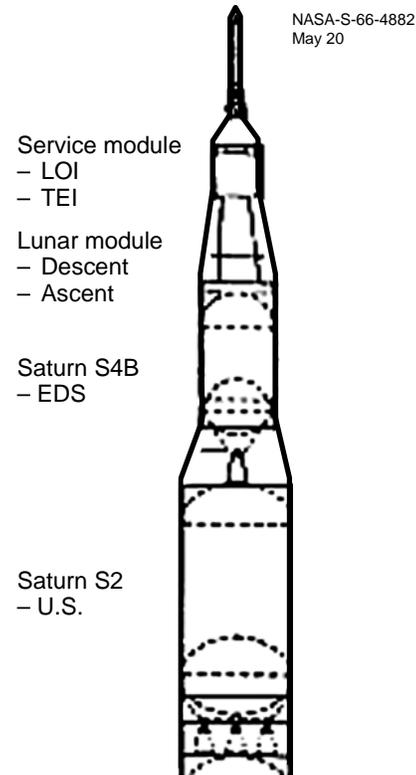


Figure 1. The Apollo program required six distinct transportation elements to send humans to the Moon. Credit: NASA

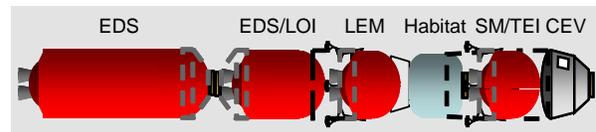


Figure 2. Common propulsion stage elements support all lunar exploration requirements.

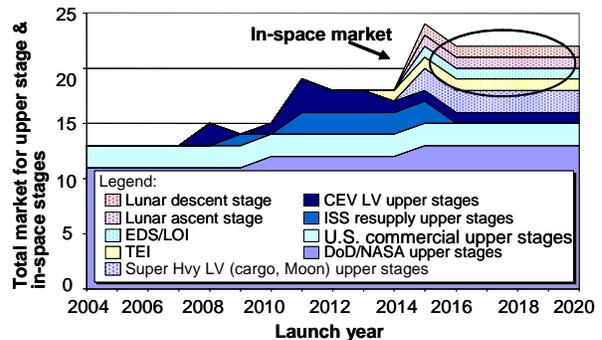


Figure 3. The combined stage market results in a high-production rate.

Just as important, commonality provides the large-flight rate required to provide demonstrated reliability, (fig. 4), allowing NASA to not rely on questionable analytical reliability calculations. All flights, exploration or other, will provide further insight into this common stage that allows continuous improvement, increasing mission capability, and reliability.

B. LO₂/LH₂ Propulsion Enables Efficient, Sustainable Space Exploration

It is useful to examine the relationship between propellant, payload, stage mass, and Isp as given by the rocket equation, Reference 1:

$$\Delta V = g \text{ Isp} \ln \left(\frac{(M_s + M_{pl} + M_{prop})}{(M_s + M_{pl})} \right)$$

or

$$(M_s + M_{pl}) + M_{prop} = (M_s + M_{pl}) e^{(\Delta V / (g * \text{Isp}))}$$

(1)

As indicated in reference 1, this equation shows payload sensitivity to changes in Isp. This equation shows that Isp has a significant nonlinear impact on system payload capability. Not as obvious is that the stage mass also grows with decreasing Isp due to the required increase in propellant load, (fig. 5).

Indeed, Lockheed Martin’s analysis indicates that the currently envisioned lunar-exploration missions using heritage storable propulsion systems (Isp~320 sec) require more than 250 metric tons (mT) initial mass in Low Earth Orbit (LEO). This same analysis shows high Isp (~460 sec) LO₂/LH₂ propulsion reduces initial mass to LEO by more than 45% to around 140 mT, (fig. 6), for the same mission capability. This mass reduction reduces the Earth-to-orbit launch cost by more than \$1 billion per lunar mission. The efficiency offered by LO₂/LH₂ propulsion offers even greater savings for Mars and outer planet missions.

To realize the benefits enabled through the use of high Isp LO₂/LH₂ propulsion one must be able to efficiently store the cryogenics for long durations. The required storage duration is driven by a combination of the planned mission duration and for multilaunch missions, the time required to assemble the mission components in orbit. Although multiple launches can be accomplished in weeks, delays for weather, anomalies, or failures could easily require many months of on-orbit storage in addition to the actual mission duration.

The short-duration lunar exploration missions envisioned in spiral 2 (~two weeks on lunar surface) could easily require cryogenic storage durations of three to six months, (fig. 7). Based on boil-off losses and mission performance partials, spiral 2 mission requirements can

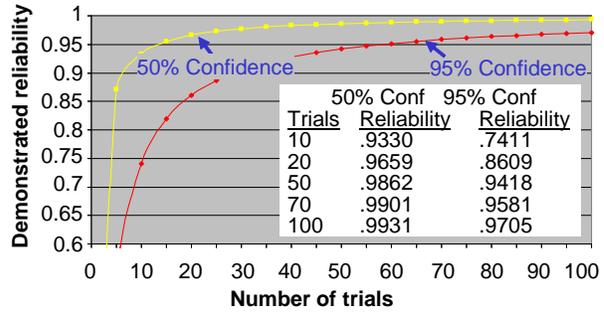


Figure 4. Achieving flight-demonstrated reliability requires a large number of missions.

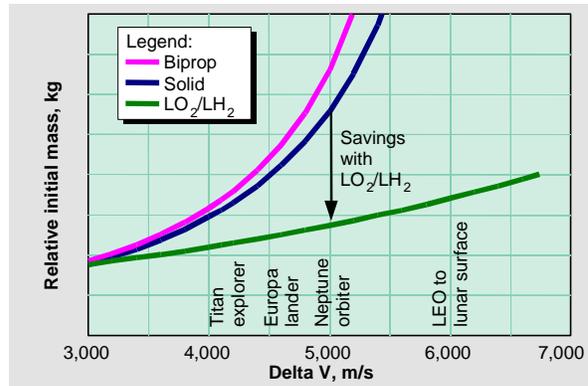


Figure 5. LO₂/LH₂ propulsion can support high-energy missions for which storable propulsion is not practical.

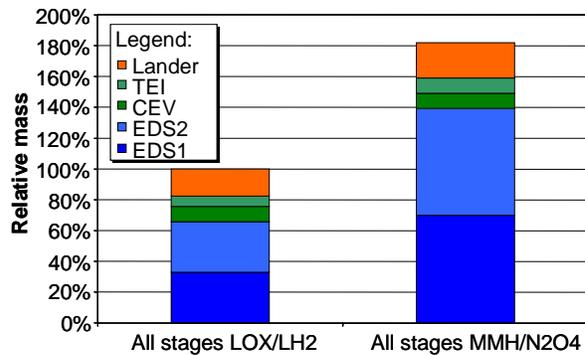


Figure 6. The use of LO₂/LH₂ propulsion for the entire lunar exploration mission provides a ~45% reduction in IMLEO relative to storable systems.

efficiently be accommodated with a combined LO₂/LH₂ boil-off rate of less than ~0.05%/day, (fig. 8). For the long-duration lunar exploration of spiral 3 that consists of multiple months on the lunar surface, cryogenic storage of up to one year may be required. This mission duration drives required boil-off rates down to ~ 0.02%/day for passive-cryo storage.

As discussed above, to truly benefit from the high Isp of LO₂/LH₂, the cryo stage must be mass efficient. This mass consists of the large tanks required for LH₂ storage, the thermal insulation, power and radiator (for active cooling), and boil-off mass. The existing Centaur provides the highest mass fraction of any LO₂/LH₂ stage, (fig. 9), and provides an ideal point-of-departure for any future long-duration LO₂/LH₂ stage.

II. Centaur Provides a History To Develop an Integrated Cryogenic Stage

Centaur provides an ideal foundation to evolve future in-space high-energy stages. The Centaur upper stage has been the mainstay for high-energy missions for over four decades, (fig. 10). Overall, there have been 159 successful Centaur missions—including such notable exploration missions as Mariner, Viking, Voyager, Cassini, and SOHO.

The key to successful usage of the high-energy LO₂/LH₂ propellants for upper stages is cryogenic propellant management, especially for missions requiring long-coast durations between burns, and multiple-burn missions. Fundamental to flying these missions is a thorough understanding of the nonequilibrium cryogenic thermodynamics and low- and zero-gravity behavior. Centaur is the only cryogenic stage that has repeatedly demonstrated this long-coast capability, both with 10-foot and 14-foot diameter configurations. LH₂ and LO₂ both have unique behaviors in low gravity, and a detailed understanding of the complex interaction of the fluid dynamics of the propellant on the tank thermodynamics is required for system-thermal management. Pressure control during the coast is critical to minimize vented-propellant, efficient use of the reaction control propellant, and to ensure that the engine conditions are met for each burn. Through regular flights, the Centaur team has accumulated more in-space LO₂/LH₂ flight experience than anyone else worldwide, (fig. 11).

Achieving the reliability, affordability, and cryo storage goals requires a synthesis of system design and technology maturation. Lockheed Martin’s unique Centaur upper-stage integrated thermal/structural design approach has demonstrated the highest mass fraction in the world at commercially competitive prices. Lockheed Martin will leverage extensive cryogenic systems expertise to develop an integrated solution for long-duration storage of cryogenics in direct support of NASA’s goal to develop an affordable, reliable, and highly efficient cryogenic propulsion system. The existing Centaur also offers the unique potential for in-flight technology demonstrations (nominally, six flights/year) that provide a low-risk

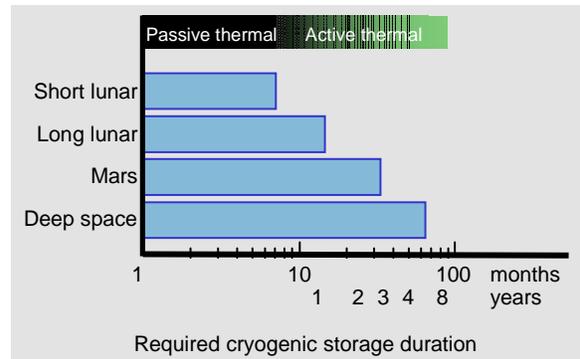


Figure 7. Near-term exploration requirements are satisfied with passive cryo storage that is enabled by the COLD technologies.

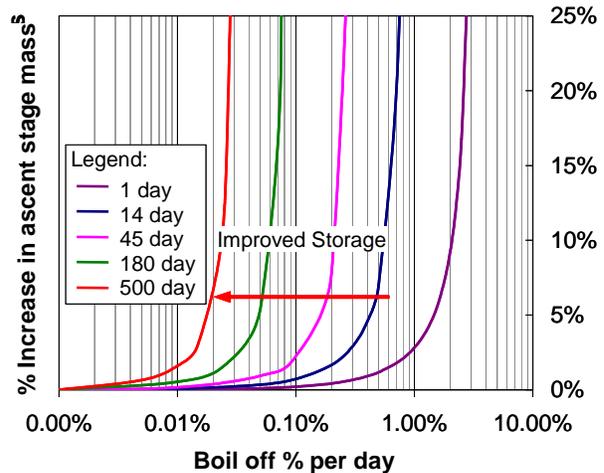


Figure 8. The required passive boil-off rate depends on the mission-duration requirement.

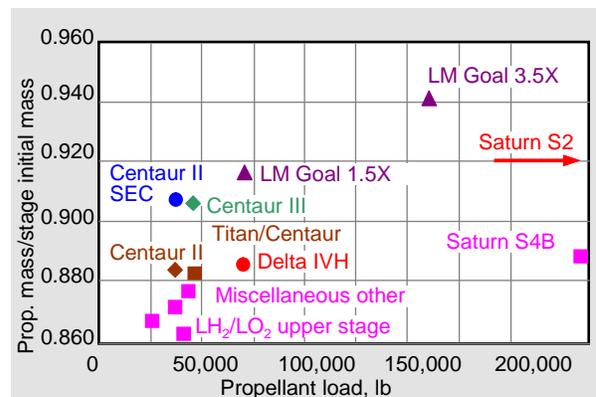


Figure 9. Centaur’s unique monocoque, common bulkhead design provides the most efficient LO₂/LH₂ stage available.

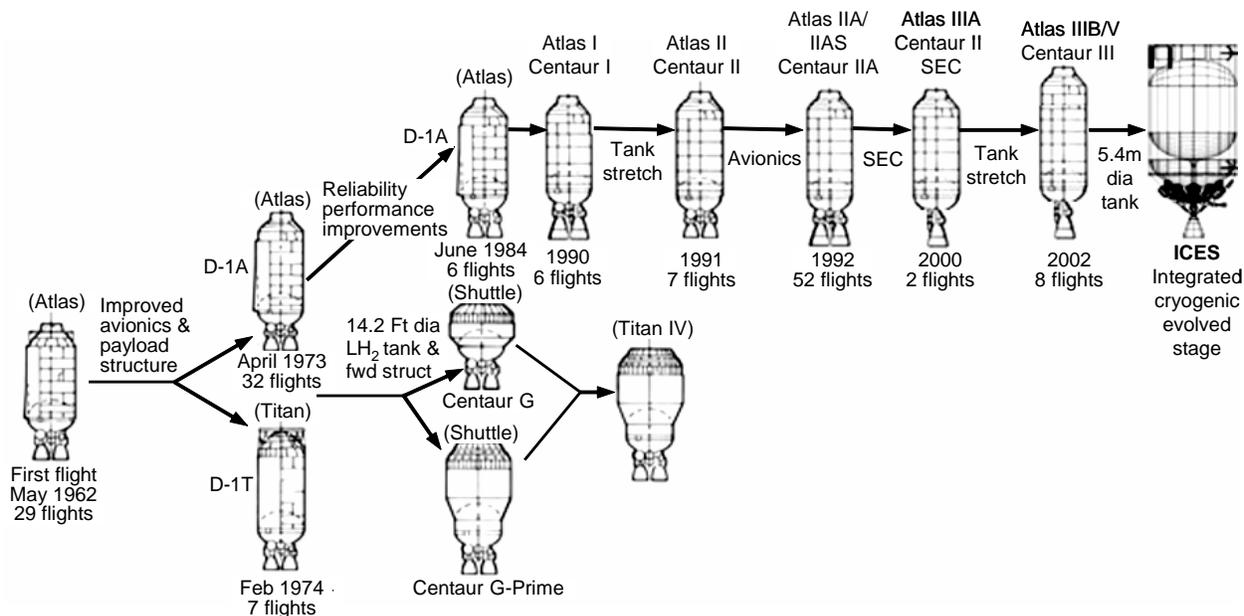


Figure 10. Centaur’s 40+ year history provides a successful, solid foundation to build the Space Exploration’s Common In-Space Transportation Stage. evolutionary approach to long-duration missions.

For the Centaur program, the understanding of the detailed thermodynamics involved with LO_2/LH_2 management began with several full-duration firing tests in NASA’s Plumbrook vacuum chamber in the early 1970s. For these tests, arrays of specially designed temperature sensors were installed inside the liquid hydrogen tank. This allowed that the extent of stratification near the liquid-vapor interface could be properly characterized while realizing that a miss prediction would result in either excessive pressurant usage, or dropping below the minimum net positive-suction pressure required by the RL10 engine. These data were further anchored to flight when two Centaurs were flown during the mid-1970s with this same complement of internal temperature sensors. One of these Centaurs demonstrated seven burns, including one that occurred following a 5.25-hour coast. These missions provided critical data that are still used today to assess the nonequilibrium conditions that exist during the mission. Centaur continues this learning tradition by regularly flying additional instrumentation and unique sequences to provide a continuous, evolutionary learning environment of the complex thermodynamic inter play of LO_2 and LH_2 in the space environment. Many of the phenomena that occur during the low-G periods still elude classical equilibrium thermodynamic modeling. Thus, semi-empirical models anchored to the Plumbrook testing, the fully instrumented missions of the 1970s, and updated with the large amount of recurring flight data and the multitude of recent flight demonstrations are critical to continued successful flight.

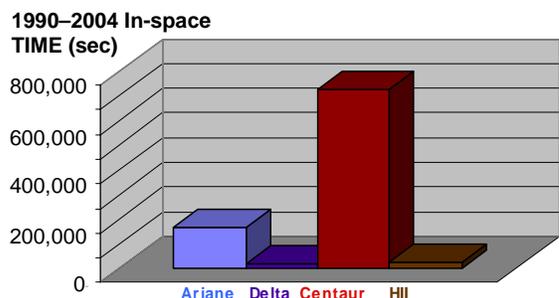


Figure 11. Centaur’s long history, high-flight rate, and long-mission capability results in unparalleled cryo-fluid management experience for the existing Centaur team.

III. Integrated Common Evolved Stage (ICES) Enables Sustainable, Extensible Transportation for Space Exploration

To satisfy NASA’s exploration needs for a cross cutting, extensible LO_2/LH_2 stage, Lockheed Martin is developing the Integrated Common Evolved Stage (ICES), (fig. 12). The ICES is designed to provide an efficient, common platform that is extensible to all transportation aspects of the exploration mission. The ICES is specifically designed to cross cut to nonexploration applications, and to provide improved support for existing NASA, DoD, and commercial launch requirements.

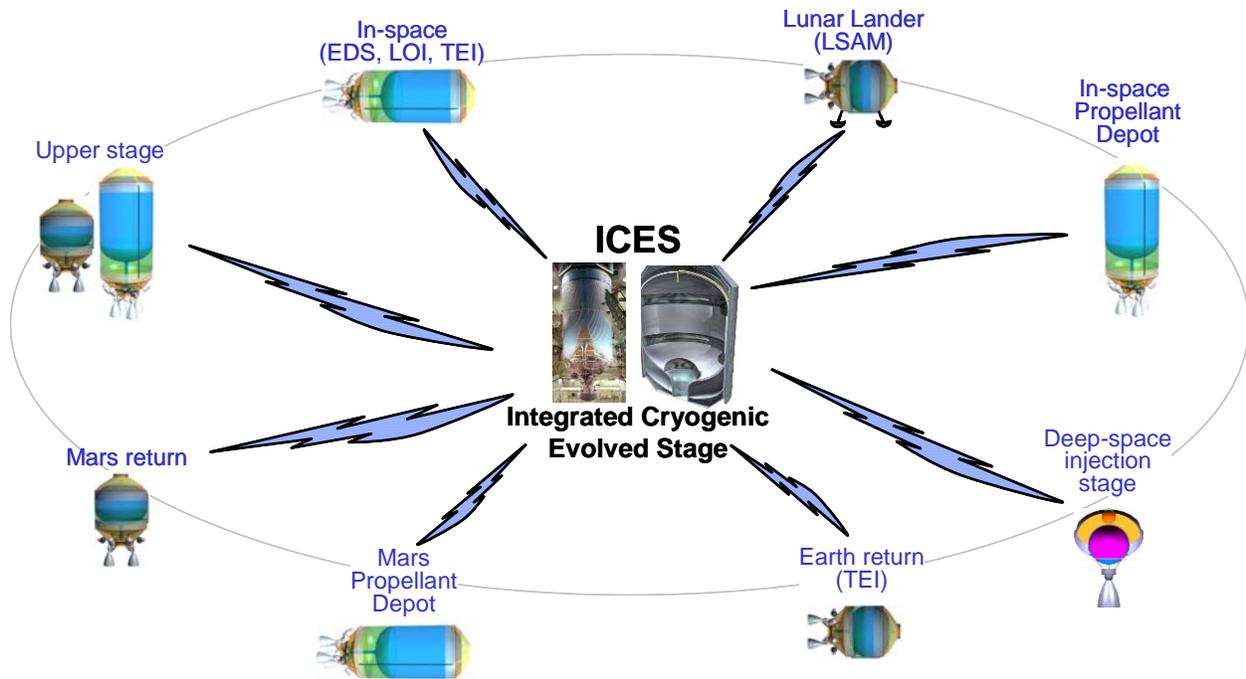


Figure 12. ICES is a flexible, modular in-space stage capable of supporting all of the lunar exploration transportation needs while being extensible to Mars and beyond.

The ICES concept will enable NASA to meet the strategic technical challenges that support a sustainable exploration program. Cross-program commonality is the key to enable a robust, reliable, and sustainable exploration program. Commonality spreads the nonrecurring and infrastructure costs between multiple users to reduce the cost for everyone.

The ICES development is planned as the first phase of any future Atlas evolution and is composed of a larger volume Centaur. This is achieved through significantly increasing stage diameter while maintaining successful Centaur heritage design concepts. The ICES is intended to become the foundation for a modular system of stages to satisfy a wide variety of uses for space exploration from upper stages to in-space stages to propellant depots. The ICES places the tremendous efficiencies of cryogenic propellants into the hands of the Moon and Mars mission architects. This allows a significant reduction in launch mass relative to Saturn, which primarily relied on the much lower efficiency of storable propellants.

The ICES is based on a simple modular design as shown in fig. 13. Common domes are joined to barrel panels through the friction-stir welding process. The barrel panels come in multiple segments that allow stages of variable propellant capacity. The common-thrust structure accommodates either 1, 2, 4, or 6 RL-10 engines. The longer ICES versions with four or six engines are suitable for upper stage and Earth-departure stage (EDS) applications that carry very heavy payloads. Shorter ICES versions with one or two engines would be used for traditional Geosynchronous Transfer Orbit (GTO) missions, interplanetary missions, or in-space stages such as lunar orbit insertion (LOI), trans-earth injection (TEI), or lunar descent stage.

ICES will take advantage of the existing Centaur subsystems such as avionics, pneumatic, and propulsion elements. The majority of these subsystems are directly applicable with little or no changes required. The primary hurdle to enabling long duration for ICES is cryo-fluid management.

IV. Cryogenic Fluid Management Is the Key to Enabling ICES

The ICES design is optimized with long-duration cryogenic applications in mind. A number of passive-thermal management features have been incorporated into the stage at the system level, (fig. 14). The tank geometry is designed to minimize the exposed surface area. The number of conduction paths into the tank has been minimized by placing all propulsion and avionics hardware onto the thermally isolated Centaur aft thrust structure (CATS). Vapor-cooling paths, where vented hydrogen is used to intercept the remaining high-load heat paths, are integrated into the tank structure.

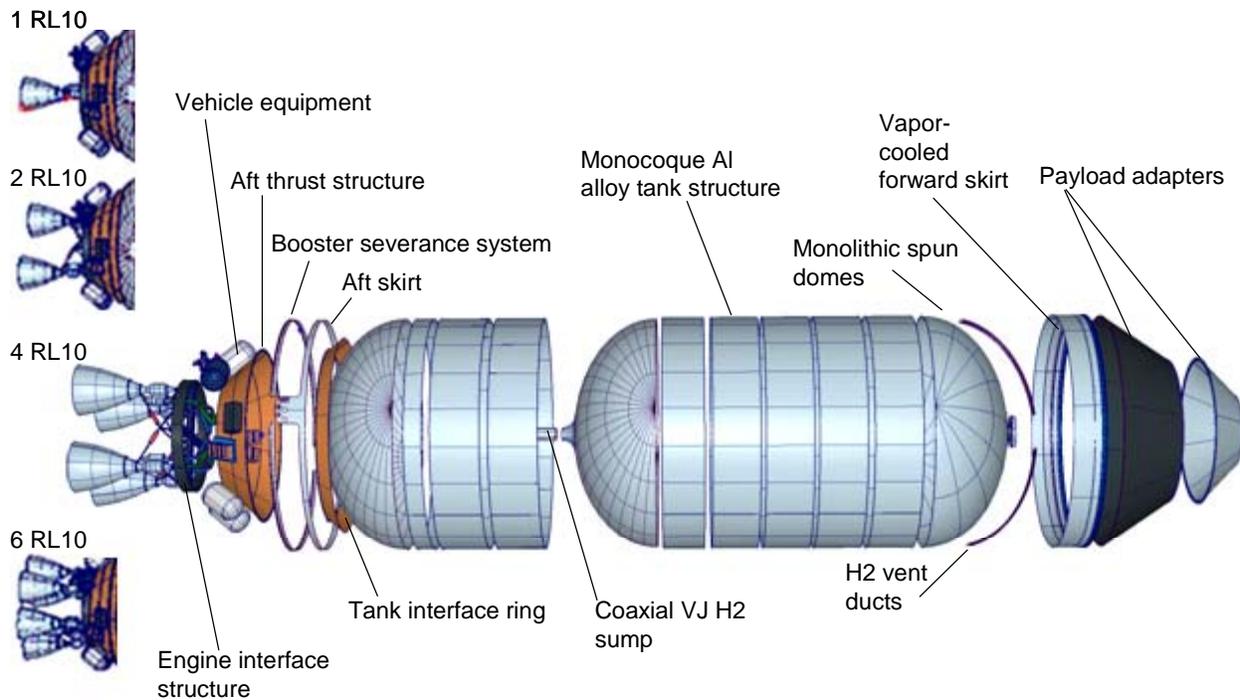


Figure 13. The ICES modular design provides flexibility to support a wide range of missions.

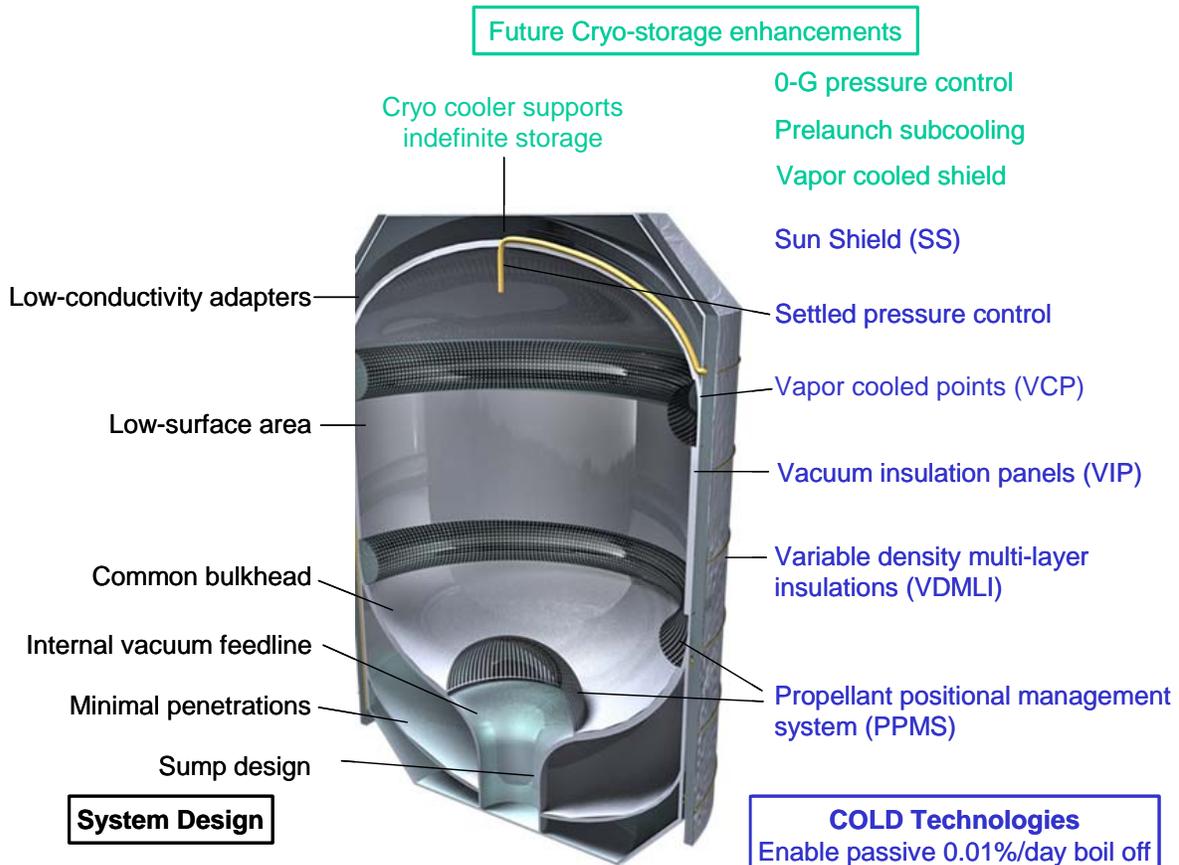


Figure 14. Six design elements and six COLD technologies enable passive extended LO2/LH2 missions.

Perhaps most important is the common bulkhead; a feature of all Centaur tanks and carried over to the ICES. Due to inherent thermodynamic properties, it is two to 10 times more efficient to vent hydrogen in terms of amount of heat removed per pound than oxygen, (table 1). The common bulkhead provides an extremely efficient and reliable method to direct all stage heating to the LH2 tank, where the energy can be efficiently removed via H2 venting to allow zero O₂ boil off.

Table 1. Venting GH₂ provides 2 to 10 times the thermal efficiency as venting GO₂.

Thermal attribute	LO ₂	LH ₂	Benefit
Heat of formation KJ/Kg (BTU/lb)	205 (88)	428 (184)	H ₂ 2 times better than O ₂
Change in enthalpy from liquid to 400 R KJ/Kg (BTU/lb)	335 (140)	3,256 (1,400)	H ₂ 10 times better than O ₂

This inherently structurally and thermally efficient design will reduce the system boil off to 0.1%/day for the baseline ICES compared to the current Titan Centaur ~2%/day. This low boil off provides a common stage that is ideally suited for standard Low Earth Orbit (LEO), Geosynchronous Transfer Orbit (GTO), and Geo-stationary Orbit (GSO) missions with mission durations up to 24 hours and provides the foundation for much longer missions.

C. Long-Duration Cryo-Fluid Management Mission-Peculiar Kit

For long-duration missions (~ one year), additional passive-thermal management features can be incorporated via mission-peculiar kits. These features include: enhanced vacuum insulation panels (VIP); variable density multilayer shields (VDMLD); propellant positional management devices (PPMD); sun shields (SS); and zero-G pressure control features (fig. 15). Taken together, these long-duration mission-peculiar kit technologies make up the cryogenic operation for the long-duration (COLD) system.

These mission-peculiar kit items can be developed and implemented as the mission needs dictate, (table 2). Initially, the technologies required to support mission durations of weeks will be implemented and directly support NASA’s Spiral 1 exploration needs. These missions will develop early confidence in the COLD system. Additional capability will be added as future mission needs demand. This will allow NASA to focus its near-term limited budget on technology needed to satisfy NASA’s near-term exploration goals. Through flight experience and on-going development, continuous improvement can be made to each individual technology and the system as a whole. Through this evolutionary, continuous product improvement process, ICES will advance the state-of-the-art large-scale cryo storage from the current Titan Centaur system boiloff rate of ~2%/day to the ICES goal of 0.01%/day.

Most of the COLD technologies required to meet the ICES cryo-storage goals have been developed across

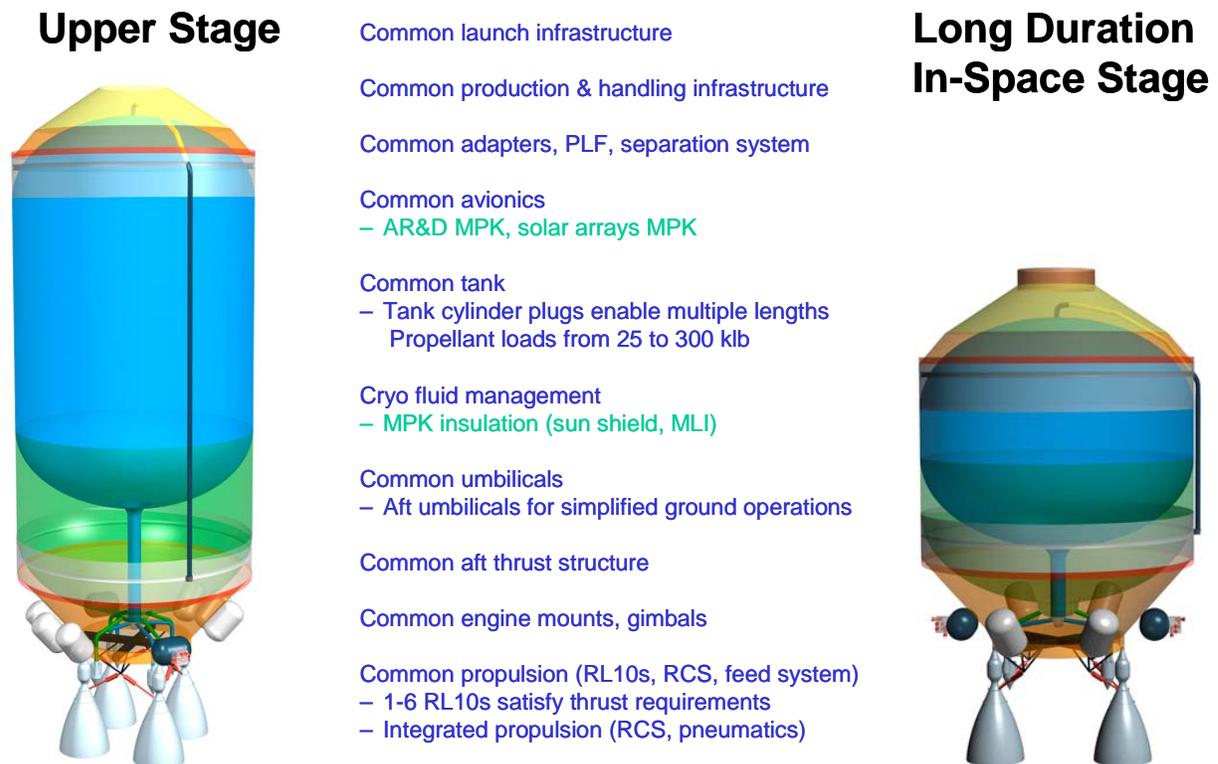


Figure 15. Through the addition of mission-peculiar kits, the baseline ICES can be enhanced to support very long-duration missions.

Lockheed Martin, at NASA, and in industry, but these technologies need to be efficiently combined in a large-scale system.

D. Passive vs Active Cooling

The purely passive COLD technologies are particularly attractive for early-lunar exploration missions allowing NASA to delay investment in large-scale active cooling systems. Passive systems are expected to be substantially more affordable and more reliable than active systems that require continuous power and complex radiator systems. For the longest mission durations, actively cooled systems will significantly benefit from the COLD technologies developed for the passive systems.

V. Exploration Systems Impact

The ICES development cross cuts many elements of the nation’s exploration program, including orbital assembly, in-space stages, ISRU, ascent/descent vehicles, and launch systems.

E. Launch Systems and Trans-Planetary Transportation

The technology encompassed in ICES enabling light-weight, long-duration cryogenic missions is directly applicable to evolutionary enhancements of existing upper stages such as Centaur and the Delta IV. Use of the COLD technologies on existing upper stages provides an early application of the technology for enhanced near-term mission capability. These near-term missions can demonstrate the effectiveness, and develop operational experience on repeated commercial and government launches before the first use for exploration.

The use of cryogenics in the trans-lunar injection and lunar-orbit insertion stage(s) provides greater mass-reduction benefits than any other architecture element. The COLD technologies are also critical to allowing on orbit rendezvous of cryo stages.

F. Descent/Ascent Vehicles

The COLD technologies in this project will enable practical cryogenic descent and ascent stages. Storable-propellant alternatives are approximately 20% heavier in gross mass than LO₂/LH₂ for a lunar-surface-to-orbit ascent module (the difference is greater for surface-to-L₁ vehicles). A COLD-based boil-off rate of approximately 0.1%/day is sufficient for lunar-mission durations of about 45 days, while the planned 0.01% rate enables very long-duration lunar and Mars missions.

G. Planetary Missions

Planetary missions currently rely on solid or storable propellant propulsion modules, or aero capture to achieve orbital insertion at another planet and have the following limitations:

- Low Isp of ~325 sec for storable liquid or ~290 sec for solids (single burn only).
- Lack of 3-axis stabilization places additional requirements on spacecraft.
- Low thrust for storable liquid systems delays final orbit insertion by several weeks.
- Aero capture limited to bodies with substantial atmospheres and detailed knowledge of the atmospheric altitude-density profile and requires an extremely precise entry trajectory.

The COLD technologies enable small cryogenic propulsion modules that mitigate the limitations of current planetary insertion options, (fig. 16). A small cryogenic propulsion module with common elements to the ICES could have multi-burn capability enabling supplemental Earth-escape burn, large-scale mid-course burns, propulsive planetary fly bys, planetary injection, and in- system maneuvers.

Table 2. The COLD technologies inserted into ICES will parallel the mission-duration needs.

COLD technologies	Mission duration				
	Days	Weeks	Months	Year	>Year
Vacuum panel insulation	Green	Green	Green	Green	Green
Settled pressure control	Green	Green	Green	Green	Green
Vapor-cooled points	Blue	Green	Green	Green	Green
Variable density MLI	Blue	Blue	Green	Green	Green
Propellant position management system	Blue	Blue	Green	Green	Green
Sun shield	Blue	Blue	Green	Green	Green
Enhanced technologies					
Prelaunch subcooling	White	White	Blue	Green	Green
0-G pressure control	White	White	Blue	Blue	Green
Cryocooler	White	White	Blue	Blue	Green
Mandatory	Green				
Helpful	Blue				

VI. Flight Demonstration

The COLD technologies embedded in the ICES project will significantly benefit from opportunities to flight demonstrate the individual technologies in the 0-G space environment. The existing Atlas® V/Centaur provides the

ideal, near-term, low-cost access to the space environment. With nominally six missions per year and frequently hundreds to thousands of pounds of excess propellant, Atlas V/Centaur missions provide an opportunity to gain confidence in the emerging COLD technologies.

Simple flight-software changes and the addition of instrumentation allow on-orbit demonstration of the COLD technologies, (fig. 17). Additionally, feed-line instrumentation allows demonstration of enhanced propellant-transfer sequences. Flight data enables optimization of vent-system designs that are critical to the overall system efficiency and reliability.

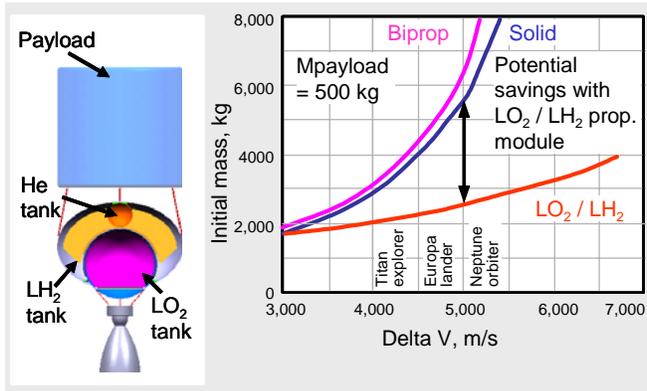


Figure 16. Miniature LO₂/LH₂ propulsion module with elements common to ICES enhances robotic exploration.

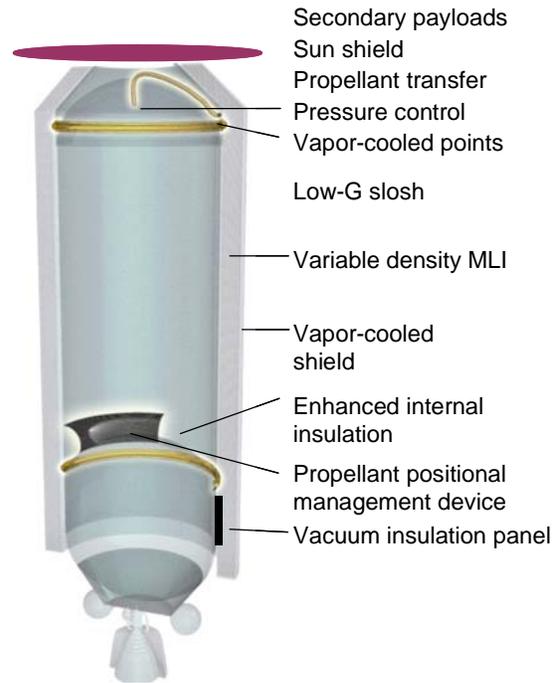


Figure 17. Centaur provides numerous launch opportunities to demonstrate cryo-fluid management technologies.

VII. Conclusion

Use of LO₂/LH₂ propulsion, vs storable propulsion, reduces initial mass in low Earth orbit (IMLEO) by more than 45% for lunar exploration. The performance benefit pays off in three ways:

- Total system mass can be reduced, lowering launch cost more than 45%.
- Increased payload and mission capability for the same total mass.
- Mission margins can be increased, allowing safer operations.

Despite the potential benefits, cryogenic in-space propulsion has traditionally been hindered by two difficulties: the expense of developing new cryogenic stages, and the challenge of storing the propellant for long durations.

Development of ICES provides a robust, flexible solution to most of NASA's space exploration transportation requirements. ICES builds on the 40 years of successful Centaur flight history. ICES improves on the extremely high-mass fraction currently offered by Centaur to provide an effective, affordable, and reliable long-duration in-space cryogenic transfer stage. The ICES design accomplishes this through improvements to all aspects of the propulsion stage, including propulsion system, structure, thermal systems, and avionics. System development to date indicates that the ICES mass fraction accounting for the long-duration mission-peculiar kit will significantly exceed 0.9.

ICES will implement the foundation for efficient cryo-fluid management in the baseline vehicle designed to satisfy NASA, DoD, and commercial customer requirements for Earth to orbit. Inclusion of the mission-peculiar kit COLD technologies enables passive-mission duration of months to years.

References

¹Griffen, M. D., and French, J. R., "Space Vehicle Design," AIAA Education Series, Second Printing (1991), P. 187.

From: "Joe Carson" <jpcarson@tds.net>

Date: Fri, July 16, 2010 8:47 pm

To: pcast@ostp.gov (more)

Priority: Normal

Options: [View Full Header](#) | [View Printable Version](#) | [Download this as a file](#) | [Add to Address Book](#) | [View as HTML](#)

Dear Ms. Stine,

As I shared, my employee suggestion on Vols4STEM is being handled in an ad hoc fashion, because its Office of Science did not write an implementing procedure for preparing, submitting, and evaluating employee suggestions, contrary to the requirements of the higher tier Dept. of Energy wide directive.

The following email thread gives an update on its status. I do not expect a prompt response. I would be surprised to get a positive response too. "Not invented here" is, in my experience, the expectable reaction of Department of Energy program offices to employee suggestions impacting their policies or programs.

If and when I get a response to my suggestion, I will provide a copy to you.

Respectfully,

Joe Carson, PE
Knoxville, TN

>Delivered-To: jpcarson@tds.net

>Authentication-Results: mx.google.com; spf=pass (google.com: best

>guess record for domain of CarsonJ@oro.doe.gov
designates

>198.207.239.13 as permitted sender) smtp.mail=CarsonJ@oro.doe.gov

>Subject: FW: Status of Joe Carson's employee suggestion about Vols4STEM?

>Date: Fri, 16 Jul 2010 14:46:39 -0400

>X-MS-Has-Attach:

>X-MS-TNEF-Correlator:

>Thread-Topic: Status of Joe Carson's employee suggestion about Vols4STEM?

>Thread-Index: AcsfouvF/wJh+cXvTbmkPFcs2mMksQC8UzCwAAXICSAANdbW0ABIAdQg

>From: "Carson, Joseph P." <CarsonJ@oro.doe.gov

>

>To: "Joe Carson" <jpcarson@tds.net

>
>X-OriginalArrivalTime: 16 Jul 2010 18:46:39.0340 (UTC)
>FILETIME=[39BDB2C0:01CB2517]
>
>
>
>
>_____

>From: Howse-Smith, Patricia A
>Sent: Wednesday, July 14, 2010 2:38 PM
>To: Carson, Joseph P.
>Subject: RE: Status of Joe Carson's employee suggestion about
>Vols4STEM?
>
>Mr. Carson,
>I am not in a position to say or know when HQ organizations will
>review or take action on your suggestion. As each organization has
>their own process and timeline for doing things, I do not know what
>is a reasonable time for them to do the evaluation, therefore, I
>will not be making any follow up inquiries. They have your name and
>email address and will do their notifications in accordance with
>their policies and procedures.
>
>Patricia Howse-Smith
>Director
>Human Resources Division
>Oak Ridge Office
>(865)576-0928-Telephone
>(865)576-6964-Fax
>howsesmithp@oro.doe.gov

>
>
>_____

>From: Carson, Joseph P.
>Sent: Tuesday, July 13, 2010 1:04 PM
>To: Howse-Smith, Patricia A; Carson, Joseph P.
>Cc: Smith, R Max; Kelly, Russell (Russ) L.
>Subject: RE: Status of Joe Carson's employee suggestion about Vols4STEM?
>
>Ms. Smith,
>
>Thank you for the update. Without having the implementing
>procedure in the Office of Science, as called for in the DOE Order,
>this is an ad hoc process though. Attached is a pdf version of the
>suggestion for your/others possible use.
>
>I submitted a "SAVE Award" suggestion, per President Obama's
>encouragement last week, about restoring, reforming, and/or

>revitalizing *all* agency employee suggestion systems - in my
>opinion the suggestions that become SAVE Award finalists should be
>nominated by agencies, based on the employee suggestions they
>adopted in the past year. I asked my management and OPEIU to
>consider publicizing it << File: vols4stem-sugg.pdf >> because this
>year, federal employees who register with the SAVE Award website can
>vote/comment upon other suggestions.

>

>I do want wish to presume on your time and attention, but who will
>follow-up with these offices about my suggetstion and what is a
>reasonable time period for their evaluations to occur?

>

>Respectfully,

>

>Joe Carson, PE

>Facility Rep

>

>Copy: Russ Kelly, Max Smith

>

>

>From: Howse-Smith, Patricia A

>Sent: Tuesday, July 13, 2010 10:07 AM

>To: Carson, Joseph P.

>Subject: RE: Status of Joe Carson's employee suggestion about

>Vols4STEM?

>

>Mr. Carson,

> I have forwarded your suggestion to HQ Human Capital with the
> request that it go to the appropriate office for review. I also
> sent it to the HQ Science Office which oversees the Science Bowl to
> see if it could be considered in connection with that out reach activity.

>

>Patricia Howse-Smith

>Director

>Human Resources Division

>Oak Ridge Office

>(865)576-0928-Telephone

>(865)576-6964-Fax

>howsesmithp@oro.doe.gov

From: "Brien Seeley" <cafe400@sonic.net>
Date: Tue, August 17, 2010 2:01 pm
To: pcast@ostp.gov (more)

Dear Dr. Stine and PCAST:

I seek to place the NASA Green Flight Challenge on the September 2nd PCAST meeting agenda as either a Public Comment or as a sub-topic to the afternoon's Energy Technology Innovation System Study. Below are 4 pertinent links that support this request, along with my condensed plea to PCAST and an image of one such Green Quiet VTOL vehicle currently under construction at Joby Energy in California.

I would be most enthusiastic to discuss this with you by phone. My inside line at the office is:

707-544-0141 (Pacific Time)

Thank you.

Brien
Brien A. Seeley M.D., President
CAFE Foundation, Santa Rosa, California
www.cafefoundation.org, host of NASA's Green Flight Challenge
cafe400@sonic.net

Office: 707-544-0141
Home: 707-526-3925
Cell: 707-484-8721

<http://shemesh.larc.nasa.gov/Lectures/OldColloq/c-100504.htm>
(NASA Langley Colloquium announcement on this topic from May 4, 2010)

http://www.nasa.gov/centers/langley/news/researchernews/rn_seeley.html
NASA's 1 page news summary of this vision.

http://cafefoundation.org/public/2010_08_16/P8.Essay.Final.pdf
The downloadable comprehensive White Paper justifying extension of the NASA Green Flight Challenge Program (please allow 1.5 minutes for 65 MB download)

http://cafefoundation.org/v2/main_home.php

From: "steven rappolee" <strappolee@gmail.com>

Date: Mon, July 19, 2010 5:19 pm

To: AskDrH@ostp.gov (more)

Priority: Normal

Options: [View Full Header](#) | [View Printable Version](#) | [Download this as a file](#) | [Add to Address Book](#) | [View Message details](#)

DR's, Holdren, Stine, Maxon,

I do have some, "burning questions" and I want to thank you for allowing the public to ask them. Some of these questions or ideas I have submitted to PCAST under the federal register announcement for submitting ideas for public viewing for upcoming PCAST meetings.

Question # 1, Does the presidents new space policy have any impact or influence on the DOE Blue Ribbon commission on spent nuclear fuel ?

Should the commission consider the new space policy in commissioning AIAA or aerospace corporation reports or studies in regards to storage of spent fuel on orbit? (In L2 or L1)

AIAA or Aerospace corporation reports on dissolving spent fuel in inert fluoridated salt for use in a future space based power generating system?

<http://www.facebook.com/topic.php?topic=57&post=786&uid=109555615732469#post786>

Question # 2 Can the proposed fuel depot be utilized to store and transport Liquid helium for space based telescope servicing missions?

<http://www.facebook.com/LoriGarver#!/topic.php?uid=109555615732469&topic=126>

Question # 3 Can the ISS and the COTS cargo systems be used to investigate Mammalian reproductive tissues behavior in microgravity?

<http://www.facebook.com/LoriGarver#!/topic.php?uid=109555615732469&topic=61>

Question # 4 Is it possible to replace RTG's with a long term storage of cryogenic fluids in an upper stage to power a payload with upper stage fuel cells, and to stow the outer planet probes solar arrays behind a aero shell for separation just before orbit insertion maneuver?

Thank you for your time,
SRA Steven Torry Rappolee Michigan Air National Guard, sophomore ST
Clair Community College

The CAFE Foundation home page

I'm Dr. Brien Seeley, President of the CAFE Foundation, an all-volunteer 501c3 organization founded 30 years ago to advance the efficiency of small aircraft.

As was true of Lindbergh's flight, a synchronicity of forces exist today that can give the NASA Green Flight Challenge the formative role in a new era in aviation. This technology prize, which aims to make safe, on-demand, emission-free, distributed air travel routinely accessible to most Americans, can re-invigorate civil aviation, reassert America's lead in aeronautics, undo road gridlock, save Billions of dollars in wasted time and petroleum and grow thousands of new Green jobs. This new era will see Americans safely and quietly flying, not driving, on trips of between 40 and 200 miles in one third of the usual Door-to-Door travel time. They will fly along myriad, layered, virtual "highways in the sky" in small, electric-powered Green Quiet aircraft that are immune to road gridlock and are nearly as quiet as a Prius but even more efficient. They will be safe to land and take off in nearly any weather at close-by "pocket airports" as small as 2 acres. Green Quiet air taxis will fly to pocket airports located within large metro hub airports to double the trip speed of large airliners. Such Green aircraft will transform our transportation system—the iPhone of aviation, if you will.

For next summer's initial \$1.65M Green Flight Challenge, or "GFC", CAFE has enrolled 9 teams, including 2 from universities, led by some of the world's most highly regarded designers. They are creating a cast of sleek new 200 passenger MPG vehicles that converge technologies from NASA, UAVs, and high-tech soaring as well as the rapidly advancing gains in Green Energy Innovation and quiet electric propulsion. These vehicles will trump the Innovator's Dilemma that afflicts civil aviation.

To use pocket airports, however, these Green aircraft must also become ultra-quiet and capable of extremely short take off and landing. And to open what NASA's Chief Scientist has called 'a potential new trillion dollar market', they must also demonstrate safe autonomous flight. GFC is the perfect mechanism to accomplish these combined aims. Allocate just \$4M from NASA's \$50M Centennial Challenges prize funding, and we can bring forth such transformative vehicles within 5 years. Making GFC a 5-year program can be for the Obama Administration similar to what the Apollo program was for JFK, except that the GFC vehicles will benefit millions of Americans for everyday travel.

Please read the Technical Justification found in the attached White Paper entitled "Faster and Greener—Pocket Airports".

From: [Mark Rosen](#)
To: [PCAST](#)
Subject: The Ultimate Green Energy Source
Date: Thursday, July 22, 2010 11:31:19 AM
Attachments: [The Electron and Electric Charge--A New Perspective.pdf](#)
Importance: High

To PCAST Members,

Our energy salvation may be in basic physics.^[1] In our quest to be less dependent on hydrocarbons, we continue to focus on the same old things – nuclear reactors (maybe smaller sizes), fusion energy (which may never reach break even), wind mills, solar cells, fuel cells (Bloom Energy), geothermal, etc.. What we need is something new and really competitive especially from the cost perspective. The humble electron with a potential new behavior to exploit may be the answer.

Mainstream physics seems to be "thriving" on complexity and ideas that are far more speculative in many cases than what I have proposed below (they have forgotten past history, KISS and Occam's Razor). I am sharing this information in the hope that it will at least start a dialogue and make people think outside the box (it has the potential to be a "game changer" especially for the energy problems we face). I have been involved with the electron in one form or another since high school with most of my interest focused on low energy behavior. It wasn't until I started teaching an introductory physics course a few years ago that I gained a whole new appreciation for the historical development of ideas we sometimes take for granted (and stop questioning).

I decided to take another look at the implications of the discovery of the positive electron (Anderson, 1932). My new hypothesis can be simply stated that electric charge is not a fixed property of subatomic particles like the electron (we are beginning to discover phenomena that might indicate this and be best described by the charge state of the electron being able to be changed). I feel that our whole conceptual foundation of "antiparticles" and "antimatter" is wrong. The reason antiparticles seem so rare is simply because they always have been -- they may be just another state of "regular" particles. We are beginning to see a larger asymmetry than expected in antiparticle production in accelerators (as reported in recent NY Times and APS articles). We really have no idea about what things were like at the beginning of the "Big Bang" (although we put on a good front). I think that the "hand waving" interpretation of the negative energy solutions of Dirac's equation for the electron incorporating relativity (1928) has misled physics since the early 1930's.

I had hoped to find some supporting evidence in the form of the gamma ray signature of annihilation (no one has made the needed measurements). It would not be that difficult or expensive to establish the validity of this new property of the electron one way or the other.

The Ultimate Green Energy Source

A Solution Based on a Proposed New Property (Behavior) of the Electron

I am sharing just the essence of a potential new electron behavior which could reshape our entire energy future. I no longer have the time or means to pursue this (I am just another victim of the financial fiasco created by Wall Street). The Gulf of Mexico catastrophe should be a wake up call about the ridiculous lengths we will go to find oil (a primitive substance that needs to be replaced as an energy source) – this critical need is my primary motivation for sharing my idea now in its very unfinished and speculative state.

We have been extremely successful at using and manipulating the electron – it is the technological foundation of our civilization. The electron may have one more trick for us exploit. A re-interpretation of the discovery of the positive electron (positron) could indicate that the charge state of the electron can be manipulated as well – something that could have an extraordinary impact on our energy future (as well as world politics and physics). The dream of science fiction writers has been to exploit the

annihilation reaction* (in this case between negative and positive electrons). Unusual discoveries made since the 1980's may give us both the proof and insight into how to change the charge state of the electron and, in the process, hopefully yield an inexhaustible and inexpensive energy source.

I have attached a short presentation in Acrobat pdf format. I hope that it will generate enough interest to explore this exciting new possibility about the electron and how it can possibly revolutionize our future energy resources.

I appreciate any help and guidance you can give.

With my very best regards,

Mark Rosen

Mark David A. Rosen, Ph.D.
mdarosen@post.harvard.edu
www.GAP-s.net

*The Ultimate Green Energy Source – 100% mass conversion, no radioactivity and no CO₂ emission

NOTE: I am aware that what I am proposing may seem to violate charge conservation and other closely held beliefs. I believe that there are answers to all possible objections.

EXPLOSIONS – Electron-positron annihilation might be a more plausible explanation for explosions seen in electrochemical cells and batteries.

[1] Even I am surprised since I left Harvard 30 years ago to try to contribute to solving our energy problems (oil crisis) because I felt basic physics had no near term relevance.

The Electron and Electric Charge

A New Perspective

Mark David A. Rosen, Ph.D.
mdarosen@post.harvard.edu

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Short History of the Electron

- **1897** Discovered by Thompson
- **1909** Charge determined by Millikan
 - The smallest unit of charge until the construct of the quark in the 1960's
- **1932** Positively charged electron discovered by Anderson (dubbed the “positron”)
 - The origin of the idea of antiparticles (mainly because of the Dirac equation with its negative energy solutions)

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The Ultimate Green Energy Source

The Solution

Particle –Antiparticle Annihilation

100% Mass to Energy Conversion

(specifically looking at electron – positive electron (positron) interaction)

No radioactivity (or transmutation) and no CO₂ emitted

The Problem

A viable (inexpensive) **source of positive electrons**

(as well as the efficient use of the gamma rays emitted in the process)

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Known Sources for Positrons

- **High Energy Particle Collisions**
 - Cosmic Rays – led to the discovery of the positive electron (Anderson, 1932)
 - Accelerators
- **β^+ decay of radioactive isotopes (²²Na)**
- **High Power Laser Interactions with Materials**
 - Gold target – recent work produced record quantities

None of these are a viable inexpensive solution

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Re-evaluating the Electron & Charge

Edwin Land (Polaroid) once expressed the following:

“Discoveries are made by some individual who has freed himself from a way of thinking that is held by friends and associates who may be more intelligent, better educated, better disciplined, but who have not mastered the art of the fresh, clean look at the old, old knowledge.”

The nature of the electron and electric charge may need a “fresh, clean look.”

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The Discovery of the Positive Electron A Different Interpretation

What if the Dirac Equation with its negative energy interpretation did not exist?

What would the discovery of the positive electron imply?

- Either we would assume
 - it to be a separate distinct entity
 - or **that the sign of the charge (charge state) of an electron is not a fixed property but can be changed under conditions to be determined.**
- Recent unusual discoveries may support the latter view

The influence of the Dirac equation may have misled physics since the early 1930's

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Recent “Strange” Discoveries

- Fractional Quantum Hall Effect (FQHE)
 - Fractionally charged quasiparticles or composite fermions) proposed
- High Temperature Superconductivity
 - Layered structures – electron motion limited to 2-dimensional planes
- Electrochemically generated excess heat
 - Unfortunately initially dubbed “cold fusion”

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Fractional Quantum Hall Effect (FQHE)

- Experimental Conditions
 - Electrons confined to 2-dimensions
 - Temperature near absolute zero
 - Strong magnetic field perpendicular to electron plane
- Theory
 - Fractionally charged quasiparticles (composite fermions)
 - SIMPLER Approach – possibly a fraction of the electrons have become positively charged
 - this would imply the gamma ray signature of annihilation should be present (a good, but not necessarily easy, test)

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High Temperature Superconductivity

- Generally tend to be layered structures
- Still no theory after 23 years
- Perhaps a new property for the electron could help
 - If the electron's charge state can be altered, this could help to explain how it could traverse the electric fields present in the layered structures without loss (charge coupling and oscillation)

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Electrochemically Generated Excess Heat

- There have been enough successful experiments to establish the phenomenon
- The cause remains uncertain
 - The claim of “cold fusion” or low energy nuclear reactions (LENR) remains controversial and has marginalized this real effect
 - Could annihilation (due to some of the electrons becoming positively charged) be an alternate explanation?

Electron-Positron annihilation might not be less controversial, but a much more plausible explanation

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Annihilation Gamma Ray Signature

- It has been established that gamma ray emission accompanies excess heat production
- The presence of .511 MeV or 1.02 MeV gamma rays would support an annihilation mechanism
- Unfortunately, no measurements of spectra below 1.2 MeV seem to exist

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Electrochemical Excess Energy

Long incubation period usually needed before the beginning of excess energy

- Recent microscopic examination of the electrode surface has possibly shown why
- Morphology changes indicate areas that could constrain electron motion allowing the surrounding cations' electric field to possibly flip the electron's charge state to positive

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SEM Photo of Cathode

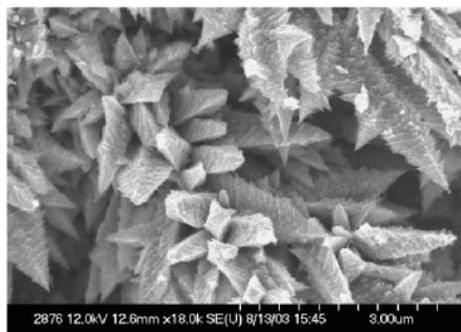
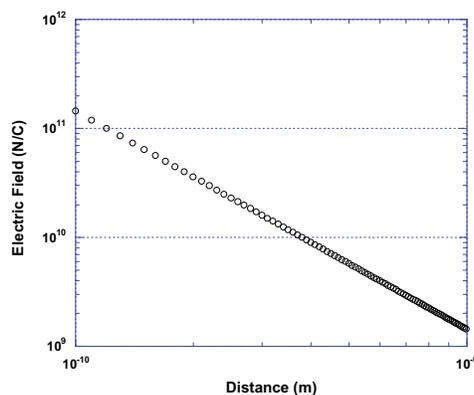


Fig. 6. Dendritic growth due to the action of the cell current on microglobules immobilized in tight pores

S. Szpak et al. / Journal of Electroanalytical Chemistry 580 (2005), p 288

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Estimate of Electric Field due to Cation and Electron



Simple approximation of the electric field (E) indicating that $E > 10^9$ N/C (multiple angstrom separation distance) is probably necessary for altering the electron's charge state

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Creating Microstructured Cathodes

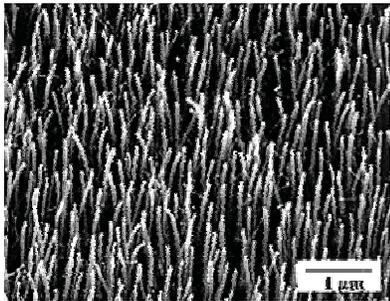
Possible Materials Ideas

- **Carbon Nanotubes** (use ideas being developed for battery technology)
- **Graphene Sheets** (new formation technology being developed)
- **Black Silicon** (Mazur Group, Harvard)

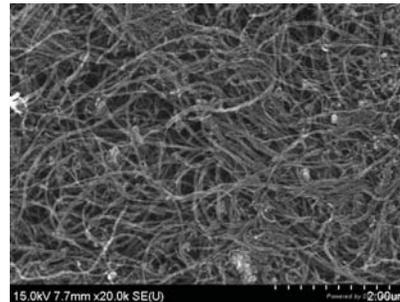
© 2010 GAPs

Possible Cathode Surface Materials

Carbon Nanotubes



Parallel Carbon Nanotubes

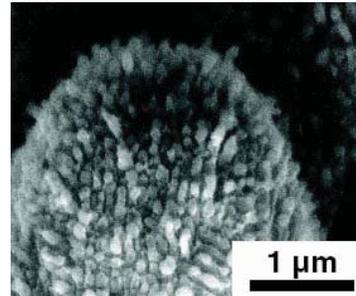
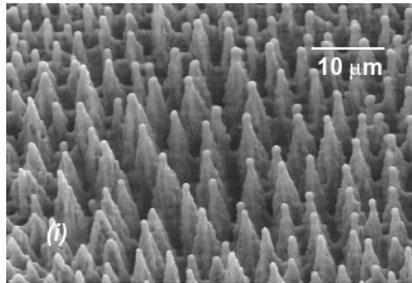


Entangled Carbon Nanotubes

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Possible Cathode Surface Materials

Black Silicon



Mazur Group, Harvard University

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Proposed Conditions To Alter the Charge State of the Electron

- Constrain the electron's motion in the cathode (allows sufficient time for applied force to cause charge state change)
 - Possible geometries: 2-dimensional graphene sheets, carbon nanotubes, processes like black silicon (Mazur Group, Harvard) and other similar surface morphologies
- Create an electric field of sufficient strength to flip the charge state by proximity to cation in electrolyte (liquid, gel, or solid)
 - Simple estimate of 10^9 to 10^{10} Newtons/Coulomb

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Summary

- **Discovery of the positive electron (1932)**
 - Alternate implication is that the charge state of the electron may be able to be changed (a new electron behavior to exploit)
- **Charge State Change -- Under What Conditions?**
 - Best estimate is given by electrochemically generated excess heat
 - Cathode with surface morphology to constrain the electron's motion
 - Can vary the applied voltage to the electrochemical cell to control the annihilation reaction based on temperature and the intensity of gamma rays produced
- **The annihilation reaction would be the **UTIMATE GREEN ENERGY SOURCE****
 - Considering the incredible energy implications, it should be worth the small cost to investigate the validity of this proposed new property of the electron

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APPENDIX

Neutral Electron?

- Many particles discovered have been seen to exist in three charge states
 - negative, neutral & positive
 - **Is there a neutral electron?**
 - Could this be the neutrino?
 - Pauli wrote in his famous 1930 letter “The mass of the neutron [neutrino] must be of the same order of magnitude as the electron ...”
 - Present estimates put the mass much less than that of the electron – This raises the intriguing question
- Is there energy (mass) associated with charge?**

From: [Randolph Femmer](#)
To: [Stine, Deborah D.](#); [Maxon, Mary E.](#)
Subject: FYI - New, free population graphs and data sets on Flickr
Date: Sunday, July 25, 2010 6:32:21 PM

Dear Drs. Stine and Maxon -

This is simply an FYI email to share with you a new set of freely-downloadable population graphs and data sets on flickr.com

The first item is here:

http://www.flickr.com/photos/pali_nalu/4824594496/

Please feel free to share or utilize these as you may wish

All best wishes as always -

- [RF](#)

Randolph Femmer

[What Every Citizen Should Know About Our Planet](#)

golddoubleons at hotmail.com

The New Busy think 9 to 5 is a cute idea. Combine multiple calendars with Hotmail. [Get busy.](#)

From: [Clark Tibbs VHO-PVI-CTA](#)
To: [Stine, Deborah D.](#); [Maxon, Mary E.](#); [Rep DeLauro via Brian Ronholm](#); [DR HOLDREN - WHITE HOUSE OSTP](#)
Cc: [AAAAMediaCNN-ANDERSON COOPER Cooper](#); [FDA-CBER Dr. Joshua Sharfstein](#); [FDA-CBER Marie Keller-Robbins](#); [FDA-CBER Leslie Wheelock](#); [FDA-Margaret Hamburg-Commissioner](#); [GFOLKERS@niaid.nih.gov](#); [media-Bloomberg Michelle Cortez](#); [media-CBS Joel Chow 10TV-Columbus Ohio](#); [mediaCIDRAP-Laurel O'Neil-for-Mike Osterholm Ph.D.](#); [mediaWSJ Betsy McKay](#); [mediaPublicCitizen-Dr. Sydney Wolfe](#); [mediaPOGO Dr. Ned Feder](#); [NIAID-NIH DR. ANTHONY FAUCI - Director](#)
Subject: To Rep DeLauro + White House PCAST-Stine+Maxon ... Contaminated hens from those 2 egg-production facilities (in Iowa) - Intralytix-claim ... of in-vivo de-contamination
Date: Tuesday, August 24, 2010 5:48:25 PM
Attachments: [Listeria - Tyson Foods Subsidiary Recalls Deli Meats - Aug 24.eml.msg](#)



Vertical Horizons One, Inc.
Helping Our Clients Make Better Decisions

TO: Rep DeLauro via Brian Ronholm 202-225-3661 House Appropriations Cmte and Dr. Holdren-White House

Deborah D. Stine, PhD
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Phone: 202-456-6034 Fax: 202-456-6021

PCAST: pcast@ostp.gov Ref: <http://www.whitehouse.gov/administration/eop/ostp/pcast/connect>

Please review, then let's talk ? Clark Tibbs 740-366-9013

-

Please go to: www.Intralytix.com ... for the current solution.

-

See this Attachment for today's latest Food Contamination News.

It seems like this is a long-series of regular events. When will it end ?

Foodborne Illness costs the USA \$150 Billion per year. Is this a 1st-world country ?

Who will enforce the food-regulations ?

Who will consider www.Intralytix.com Bacteriophage-Tools ... for the current solution ?

-

-

Please watch the 1997 BBC Video, if you have not already done so ?

If you just watch the first 10 minutes, you will want to watch the rest.

It is important to know some of the "decades of history" regarding Bacteriophages (Phages).

1997 BBC Video on Bacteriophage:

<http://video.google.com/videoplay?docid=8887931967515748990>

or

<http://www.videosift.com/video/Phage-The-Virus-that-Cures>

-

Please call 740-366-9013 for clarification and for questions.

-

----- Original Message -----

From: [Clark Tibbs VHO-PVI-CTA](#) **To:** David.Zeitz@fsis.usda.gov ;
VALERIA.JEFFERSON@FSIS.USDA.GOV

Cc: [INTRALYTIX-JOHN WOLOSZYN-CEO](#)

Sent: Monday, August 23, 2010 3:18 PM

USDA certainly has testing facilities out in Iowa. Shipping the sick birds (too far) may be too much ... but it can be done if they really want to find a solution.

-
You could ship the Salmonella-phage cocktail out to Iowa and Val could set up the arrangements for testing and help with the protocol !

-
-
Ms. Val Jefferson USDA-FSIS VALERIA.JEFFERSON@FSIS.USDA.GOV 301-504-0846

Deputy Director of Risk and Innovation Management Division (RIMD)

-
-
David C. Zeitz, DVM - Public Health Veterinarian - USDA/FSIS/OPPD/RIMD **301-504-0851**

Main Office Phone: (301)504-0884 -- Fax (301)504-0876

George Washington Carver Center (GWCC) - 5601 Sunnyside Ave., Mailstop 5271 - Beltsville, MD 20705-5271

Email address: David.Zeitz@fsis.usda.gov

-
-
More to come later today ... Sir.

-
Clark Tibbs

Vertical Horizons One, Inc.

CAGE CODE: 1YVT1 TIN: 31-1797173

SBA 8(a) Certification # 108919

Service Disabled Veteran Owned Small Business (SDVOSB)

Phone: 740.366.9013 Fax: 740.366.5230 Cell: 740.502.9010

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GSA Contract Schedule 874 (MOBIS) GS-10F-0336N Schedule 70 (IT/IS) GS-35F-0395N

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From: [Clark Tibbs VHO-PVI-CTA](#)
Subject: Listeria - Tyson Foods Subsidiary Recalls Deli Meats - Aug 24

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-

Tyson Foods Subsidiary Recalls Deli Meats

Manufacturing.Net - August 24, 2010

SPRINGDALE, Ark. (AP) -- A New York subsidiary of Springdale-based Tyson Foods Inc. has recalled 380,000 pounds of deli meats that may be contaminated with **Listeria monocytogenes**.

The U.S. Department of Agriculture announced on Tuesday the recall by Tyson subsidiary Zemco Industries of Buffalo, N.Y.

The USDA news release said the deli meats were sold to delicatessens that used them in making Marketside Grab and Go sandwiches.

The release said there were no reports of illnesses associated with consumption of the product. Listeriosis can cause high fever, severe headache, neck stiffness and nausea.

Comments from OpenPCAST

<http://pcast.ideascale.com/>

Arctic Ice melback impacts on North America

A registered to attend and make a 2 minute presentation at the September 2 PCAST meeting.

Following is an abstract of my presentation:

Melt back of Arctic sea ice is not about breaking the 2007 record for ice extent. Rather, it is about the impacts that open dark ocean is having on weather and climate of the Northern Hemisphere.

Recent research points to how changes in Arctic sea ice have the potential to influence: temperature and precipitation in the US Midwest; the formation of extra-tropical teleconnection patterns; timing and intensity of Asian monsoon; and, intensity of cold wave transport from the Arctic region to lower latitudes.

Given the importance of North America's agricultural base to world grain supply and reserves, it is of vital importance that USGCRP, in collaboration with NSF, WMO and possibly European counterparts, undertake a comprehensive research effort to determine impacts of Arctic sea ice melt back on North America, in particular, and the Northern Hemisphere in general.

This task (or initial establishment of this research program) should be included in the President's FY 2012 budget request.

I would appreciate your acknowledging receipt of this comment.

Thank you for your time and attention.

John McCormick

Energy Policy Center

7818 Friars Ct

Alexandria Va 22306

571-331-1066

Improve Innovators' Compensation for their Individual Contributions through Microroyalties

We as a society have not quite figured out how to fairly compensate all innovators. Fear

is the biggest inhibitor to progress. Misunderstanding causes fear. Not understanding how one will be compensated for his/her ideas is probably the biggest inhibitor to innovation. In short, people (and organizations) fear that their ideas will be stolen by someone else and they won't get any credit for them. This makes collaboration extremely difficult so innovators are often stuck innovating in isolation greatly reducing everyone's productivity. Our society does not appear to know how to reassure innovators about how to give and take credit for ideas.

For example, why should I post my best ideas here on OpenPCAST unless I can be assured someone won't take them and leave me behind? On the other hand, ideation software such as BrightIdea could be a huge productivity enhancer if the participants know they will be fairly compensated. Some altruists might conclude such beliefs are examples of selfishness. Altruism doesn't keep a family fed.

Government salaried innovators and some in academic institutions used to be assured job security and a steady fair income so they could be very altruistic. However as citizens began demanding more accountability from Government, jobs there have gotten just as competitive and have begun to look just like private sector jobs in terms of the same issues of fairly appropriating funding and giving credit to high-performing departments and agencies. Unfortunately, accountability appears to discourage altruism.

An ideation site like BrightIdea should implement an ecosystem for idea compensation that pays cash rewards for the best ideas. Crowdsourcing could be utilized to fairly compensate contributors. IP law will always be important. A software product like BrightIdea could establish a simple, equitable and understandable IP ecosystem which would alleviate contributors' fear thus allowing them to contribute openly and freely knowing they will be compensated fairly.

I call the concept Microroyalties. A Microroyalties economy would bring huge dividends to society. It would allow microeconomies to flourish much like microloans have done, thus employing many information workers who otherwise would have been unable to contribute productively. Presently, these potential contributors might not be producing because they are not part of a company therefore have no way to be compensated for their efforts. Or their company requires them to focus on other non-innovation tasks and does not have a way to compensate them for the time they spend developing good ideas. Microroyalties allows part-time innovators to contribute ideas and be compensated fairly while at the same time learning to improve their thinking and ideation skills so that they may be able to be promoted to full-time innovation positions in the future. Or it might allow them to strike a perfect balance between innovative dreaming and hands-on experience to maximize both their ability to produce today's products but also envision improvements for future products. Most companies recognize that the best innovations come from employees and customers who are working with and using the products every day.

Microroyalties streamlines Open Innovation because innovators are fairly compensated whether they are inside or outside the product group. It eliminates the "not invented

here" barriers erected by uncertainty of how credit for ideas will be allocated. Perhaps if the compensation system is well-enough defined and accepted, innovators could be empowered to retain their intellectual property rather than signing it over to companies, therefore restoring more equity to the people who contribute most to a product's success. That should also reduce the huge salary disparities between contributors and top management that most all citizens and legislators decry as the most stark evidence of capitalism's failure to balance the needs of all members of society. In addition, it should bring jobs to our jobless recovery. When citizens are productive and recognized appropriately, even part-time, they are like to be much happier and less likely to be afflicted by mental illness, or resort to crime or substance abuse. Since Microroyalties is a cloud-computing-based workplace, it might also help to alleviate regional disparities in economic prosperity, therefore potentially reducing famine, poverty, and the need for war.

I submitted the first thinking about his idea for an "ideation challenge" on the Silicon Valley Innovation Institute's BrightIdea WebStorm in April of 2008 . It is very interesting to come back to this two and a half years later. I have since applied for a patent describing the way to implement this idea and I am now looking for funding and partners to build a prototype of the patent-pending concept. We have incorporated Microroyalties, LLC, and are presently recruiting the management team. Hopefully some day you will see microroyalties implemented in the myriad ideation and collaboration systems available to companies and communities today. Please give this idea your "thumbs up" so it can happen sooner rather than later!

By Dave Guerrieri

Comments:

1. I mentioned in a comment on my proposal, I really like this idea and would like to see PCAST incorporate it into its open government initiative.

In particular, I like the prospect of innovators and managers in business, education, and government (as well as outsiders) analyzing how to encourage developments in education and business that reduce existential and global catastrophic risks and create more jobs in that area in the near-term.

Improve OpenPCAST Idea Collection Platform

Use BrightIdea WebStorm rather than IdeaScale to manage OpenPCAST because it is a more full-featured platform. Or use both and let users decide which they like best.

By Dave Guerrieri

Comments:

1. Dave Guerrieri said:

A missing feature in IdeaScale is the ability to change one's vote later. WebStorm allows this.

2. neurobionetics said:

I would like that feature.

Someone on a Future Salon message board also mentioned the idea of requiring users post a comment when they vote against an idea to discourage negative votes that are merely part of a competitive strategy, without a substantive basis.

3. Dave Guerrieri said:

To be fair we should probably also mention SAP IdeaPlace (https://ideas.sap.com/community/community_and_services/oifs_pcast_general) because they sponsored the excellent Future Salon this week at their office in Palo Alto!

Also, if you would like to try out BrightIdea WebStorm see: <http://www.ecomagination.com/challenge>

Assistance with Individual Patent Costs

As a small entity inventor, I have multiple potentially beneficial ideas. As those familiar with the process can attest, the road from idea to conceptualized invention to patent application is intrinsically difficult. It is unfortunate that the cost of application serves as

a further, and unnecessary, obstacle which must be overcome.

From personal experience, the existing small entity discount serves only to make the process possible. I would propose further assistance for individual inventors, as they are most impacted by the cost (the application and search fees for larger entities being a much smaller relative cost, when compared to their overall business model).

Creative incentives could take the form of: a tax credit for the application, search, and issuance fees applicable to the inventor's personal income; deferral of the application, search, and issuance fees to the time of the first maintenance fee (3 years after issuance); forgiveness of the application, search, and issuance fees altogether in return for a small government ownership in the resulting IP (say, 5 %).

I have greater than 30 conceptualized inventions of my own. Certainly some of these will be found to be covered by existing patents, yet more will prove commercially non-viable. However, were even 10% of the total to prove successful, this would yield 3 new inventions to improve the standard of living, alleviate suffering (most of my inventions are in the medical field), and provide new American jobs. Under the current system, I will be able to move forward with, at most, one idea per year... My most promising invention has already suffered 6 months of delay due to the high cost of filing and I am only one entrepreneur. The true cost of all delayed and lost creativity must be staggering.

Thank you for the opportunity to share my concerns and possible solutions. I look forward to your positive changes in the months ahead.

Respectfully submitted;

Darren Nolen, P.E.

Comments:

1. Don Fitchett said:

Darren's idea is the best one yet, resulting in the greatest ROI. As the author of a couple books on "The True Cost of Downtime" and a somewhat expert, I urge you not to take Darren's sentence lightly ...

"The true cost of all delayed and lost creativity must be staggering."

As many more people, do not even consider the possibility their ideas could actually be patent, because of the cost and the process complicity.

Another idea to alleviate the cost barrier of new inventions, is a reversed insurance based model. Were the few million/billion dollar inventions that actually make it to market, pay for the rest of patents that did not (via new-

invention tax). So the patent process is virtually free. (A small fee to deter waste of time.)

That would really go a long way to restore the 'American Dream' hope and possibility, while taking us out this economic slump. I know it goes against our countries motto 'The rich keep getting richer' (because they are the only ones who can afford to patent their inventions) .. 'While the poor keep getting poorer', but I feel a country should remove all barriers it can to innovation and new markets, to insure its own success.

1. Dave Guerrieri said:

I agree that IP law and more generally, respect for each other's talents and works, needs to be made more a part of everyday life. Trading Government financial assistance to start-ups for a stake in the company might not be a bad way to go to lower the barriers imposed by high cost. However, those barriers serve a purpose to filter out the non-viable ideas from the best ones. Less than ideal treatment of IP is without a doubt the biggest obstacle to society's increased innovation and productivity, but simply lowering the cost of patent applications is not the solution, I'm afraid. Many other barriers need to be addressed, not just the cost of issuing a patent.

I still vote this idea "thumbs up", however, because it highlights how important the treatment of IP is to the future of the world.

2. Dave Guerrieri said:

Unfortunately, I fat fingered a "thumbs down" but IdeaScale won't let me change my vote now. I would prefer if they used BrightIdea WebStorm instead. In any case the vote is off by two due to my mistake.

3. Dave Guerrieri said:

By the way, please see my idea about microroyalties. I hope it might help clear up some of the IP rights mess and lower the cost of innovation like you too are asking for here.

4. neurobionetics said:

I voted in favor of this idea and would like to see it considered along with Dave's microroyalties proposal.

Catalyze Education and Industry in Existential Risk and Global Catastrophic Risk Reduction

There is no agenda for innovation more important for humanity to undertake than the identification and reduction of “existential risks” (human extinction risks). Following that are global catastrophic risks our civilization could survive.

The effort to reduce existential and global catastrophic risks involves information technology (rogue artificial intelligence, infrastructure threats), biotechnology (bioweapons, virulent contagious diseases), and nanotechnology (nanoweapons, nanorobots). These "golden triangle" technologies also are of great interest economically, and young people can become inspired to work in them based on the need to reduce existential risk and global catastrophic risk. Like the anti-terrorism agenda, a focus on risk reduction also has the potential to unite the U.S. with other nations in applying science, technology, and innovation to cooperative efforts

Expansion of industry to meet demands of such risk reduction - in the near term as well as the longer term through education - could generate many white and blue collar jobs, and provide a boost to the economy that will not disappear over time, since the demand will be self-perpetuating (new risks will be determined and risk reduction can always be improved) as well as in everyone’s rational self-interest. Improving analysis of potential interactions between risks and proactively developing solutions and contingency plans (including how risks may impact the economy) would seem to be an especially promising area for commercial development. In turn, commercial development would spur more innovative solutions for risk reduction.

There may be tens of thousands of people working on specific risks including arms control, severe climate scenarios, mega-scale natural disasters, asteroids, technological weaponization and many other particular risks. However, instead of viewing these risks as fundamentally dissimilar, they can all be classified as “existential risks” or “global catastrophic risks.” Popularizing these classifications, with objective weightings for things such as the significance of impact, the likelihood of occurrence, and the time horizon to avert, would facilitate wiser allocations of (inter)governmental resources and contribute to synergies between various risk reduction institutes and companies (e.g. via

shared conferences, publications, web tools, business solutions, etc.). This could be especially beneficial to those working on reduction of existential risks, which receive much less attention than some global catastrophic risks, e.g. some forms of large-scale terrorism.

Ideally, a government panel would be formed as soon as possible to explore how to highlight and reward the study of existential and global catastrophic risks in education and catalyze industry quickly around the reduction of such risks, both to serve that primary aim and secondarily to create valuable jobs that help boost the economy, many of which will relate to information technology, biotechnology, and nanotechnology.

Some institutes that deal with existential risks include the Future of Humanity Institute (FHI) [<http://www.fhi.ox.ac.uk/research>], the Singularity Institute for Artificial Intelligence (SIAI) [<http://www.singinst.org>], the Institute for Ethics and Emerging Technologies (IEET) [<http://www.ieet.org>], and Lifeboat Foundation [<http://lifeboat.com/ex/about>].

By neurobionetics

Comments:

1. Dave Guerrieri said:

Please see my idea for microroyalties because I believe it will be the best way to jump-start collaboration between all of the best thinkers in the world. A microroyalties ecosystem focused on the biggest problems might actually pull off a breakthrough in record time because the needless fighting over compensation for credit/IP rights should go away allowing contributors to focus on the task rather than status or pay.

2. neurobionetics said:

I read the proposal following your comment and gave it a "thumbs up."

I would love to see a lot of rewarded solution analysis regarding existential and global catastrophic risk reduction that is open to everyone, but particularly innovators and managers in business, education, and government.

I would like to see PCAST recommend that a system of microroyalties be created as part of the open government initiative to address a wide variety of

topics, but with special emphasis on the most serious problems in need of innovation, such as existential and g.c. risk reduction, which as I mentioned offers benefits including promoting cooperative transnational application of STEM field education (as opposed to, e.g., more weapon development applications).

Giving context to STEM with social models

Key advances in the design of agent-based computer modeling and simulation platforms (such as NetLogo and StarLogo) increase the ability of students with different educational levels to quickly construct, experiment with, and share meaningful representations of the social, technical, and natural systems they live within. I refer to these as "reflexive models" because in these models we are invited to imagine ourselves as a computer agent in the system and experiment with the ramifications of simulated human agency in the real world. Moving back and forth between the computer model and the real system in this way uses one's experience with the system to validate, extend, and build meaning into the model. The result is a personal sense of ownership in the model, a deeper connection to the modeled system, and a pathway to a scientific and technical self-identity that is key to later success in STEM.

To develop a practice of reflexive modeling we need to create the social institutions that promote collaboration in models of real world problems and real world systems. Technically this requires us to develop sets of data to build our models upon (such as GIS data), construct libraries of modeling templates organized by scale and resolution that students can retool to increase the speed of prototyping (e.g. a detailed model of a household when the system model is of a neighborhood of ten houses versus a simple model of a household when the system model is a city containing tens of thousands of households), and establish a suite of robotic networked technologies that students can control using their models (such as the controls of automatic sprinklers). These technical advances must come together in a social process, which can take on many different forms. One social process, for example, could be through one or two week long summer camps that bring students, parents, educators, and leaders from a local community together with expert modelers to create computer simulations of the various systems that make up or affect the community. Our goal as experienced modelers and educators in this process is to build pathways where learning and exploring together using models can translate into multiple discoveries of the social capacity to affect change in the world.

By Matthew Francisco

Comments:

1. Given that IT and health care are the main areas of economic growth right now, and many fields within those areas require the use of conceptual models, it would seem productive to educate as many people as possible in the construction of such models, which with systems like microroyalties could create new jobs and prepare people for the kinds of jobs that will exist in the future.

Motivating Humans for Math, Science and Engineering

No other, positive, good and wholesome, human driven event in the industrial or technological age has inspired and motivated, worldwide, youth and adults alike than the pursuit of human exploration of space; namely our landing on the moon over 40 years ago. Given that our modern psyche has been debilitated by our innate gravitation towards instant gratification as a result of the industrial or technological age, and the associated reduction in attention span of our society, no other, positive, good and wholesome, human driven event of record could further inspire and motivate the masses than a human mission to Mars. Not a farfetched promise or inkling of action, but the real and committed goal of starting it today and accomplishing the goal, uninterrupted by bureaucratic ego-mongering and cost driven design changes, in the decade to come. A goal that is put off to a future generation is a goal most likely not worth working on and provides little or no gratification to those working to create it.

By: Donald C Barker

At Home Federal Employment

Many Functions of the Federal Government are computer based, I.e. Patent and Trademark Examination, Rule Composition, Auditing, Contract Design and Maintenance. Yet the Government requires employee location at a specific site. With current digital technology, Internet and net-meeting, employees could be located in any state with only internet links to the agency; thus allowing any agency to select from candidates located in any of the states. The benefit would increase the available pool from which to select and provide more effective and responsive solutions to federal problems.

Joe Prugh said:

When I was with FDIC as a consultant in 1999, we had several people do tele-commuting via the internet, but many managers still insisted that you be able to attend meetings in person on short notice. The idea has some merit but there are many old line managers who will put road blocks in the way of this on a very low level.

Don Fitchett said:

Not only would this save money by improving the selection pool, but cuts down in the overhead by amounts most do not realize. Many of those working for BIN95.com have never visited the office. Hired remotely, and work remotely. It's help us survive during this recession.

Vaccine against HIV/Cancer

My partners from Vladivostok create a ne vaccine against HIV.They lookin investment financial/santific fpeople for do Clinical Trail Research in Russia with it.Basic info in web:www.vaccine1.narod.ru,or e-mail:dalaqua@mail.ru

Sincerely yours

Voldemar Kosols

Hope and inspiration needed for teachers and students

The future is inspirational. The future is its own reward. The technological marvels of the future are very inspirational. Monetary rewards create bureaucracy, which defeats inspiration.

The NASA TV live feed (ISS) should be continually streamed into public buildings such as banks, or train/bus stations etc. Even if nothing is happening on the ISS, and all that can be seen a shot of the Earth beneath the ISS, this will be very inspirational.

<http://www.nasa.gov/multimedia/nasatv/index.html>

All people in their everyday lives need to be aware of the wonders of science, space, technology, happening all the time. There is a lack of public awareness regarding science and technology. Great wonders and strides forward are being made but the information is not properly reaching the majority of people. A large publicity campaign needs to be launched.

donald.c.barker said:

First, the future is an abstract concept and therefore cannot act as a source of inspiration or reward in a measurable or generic sense for any human; though, technological and architectural "marvels" can themselves be very inspirational. Second, Monetary rewards don't create bureaucracy, humans do and human accountability, or lack thereof, is the means of sustaining them. Money does not inspire, but itself is a secondary reward for motivating human behavior. These concepts must be clearly understood and addressed.

Lastly, NASA TV is marginal channel, both in content and as a source of communication, at best. It has great potential, but that has never been realized. Therefore, broadcasting it willy-nilly as a requirement will just bore the public and possibly even do more damage than good. There is definitely a lack of public awareness regarding all science, technology and NASA itself, unless it fits into the "keeping up with the Jones's" theme or makes us look cool. What NASA needs is a succinct, inspirational, short term goal that garners all that public interest in space and new frontiers.

So much potential, so little realization.

singularity.utopia said:

If the future is an abstract concept, which cannot inspire people, then why do people look forward to Christmas or summer holidays?

Monetary motivations are based upon distrust and inequality, where some people are paid more than other people, therefore when people work for money they don't work primarily for the love of work, they work for the money. The distrustful nature of monetary-orientation creates bureaucracy. Money is a poor motivation for human behavior. Accountability is required when people cannot be trusted. We need faith in human nature, not faith in financial institutions.

NASA TV is only marginal due to a lack of official support. It would not bore people if disseminated in the manner I suggest unless the people viewing it are beyond all hope. The potential could easily be realized.

singularity.utopia said:

How can anyone be bored by live TV from space?

People need to open their minds, and live TV from the ISS could be the catalyst for people rejecting their narrow-world-views.

Ideas on bio/nano/info technologies

I am an educator that works at a museum. My job is to introduce new technologies to families so they can better understand the issues surrounding them.

I have found that most people who visit me are woefully under-informed on nanotechnology and biotechnology topics. Most cannot even define biotechnology or nanotechnology, much less point out relevant examples of these items in their own lives. Those that are aware often seem to be focused on the potential dangers that have been pointed out by special interest groups and know little of the benefits that can be reaped from these technologies.

I believe education is the remedy for this problem. As an informal educator I do my best to contribute, but so much more needs to be done. Public school teachers need the education and resources to include exploration of these technologies in their own classroom. Portrayals of the technology need to be balanced, with a thorough discussion of the pros and cons of the technology being held in the public eye, not kept to the back rooms of academia. If the discussion isn't appealing enough to draw the public's attention, then it must be made so through easy-to-understand demonstrations of the technology and the use of advocacy by public figures.

The more ignorant the general public remains of these technologies the more resistant they will be to its implementation. Educating people about these concepts early and often should be main goals of any administration.

Motivating Humans for Math, Science and Engineering

No other, positive, good and wholesome, human driven event in the industrial or technological age has inspired and motivated, worldwide, youth and adults alike than the pursuit of human exploration of space; namely our landing on the moon over 40 years ago. Given that our modern psyche has been debilitated by our innate gravitation towards instant gratification as a result of the industrial or technological age, and the associated reduction in attention span of our society, no other, positive, good and wholesome, human driven event of record could further inspire and motivate the masses than a human mission to Mars. Not a farfetched promise or inkling of action, but the real and committed goal of starting it today and accomplishing the goal, uninterrupted by bureaucratic ego-mongering and cost driven design

changes, in the decade to come. A goal that is put off to a future generation is a goal most likely not worth working on and provides little or no gratification to those working to create it.

Just some thoughts: Donald C Barker, 2010

FDA Regulatory Reform

Key changes need to be made to FDA regulations regarding clinical trials for asthma. Many US Biotech companies have an excellent idea as to where a cure lies, but are restricted by unnecessary restrictions on the testing of vaccines. A breakthrough in this area alone would represent an incredible social benefit to the world as well as contribute greatly to the US GDP. There are many more examples of instances where the government can quite easily update their regulatory position based on new information and encourage drug discovery in a very cost effective way.

Syncrude Production

The U.S. has existing infrastructure to manufacture, distribute, and use 150 billion gallons of gasoline a year. It does not have the infrastructure to domestically produce the amount of crude oil needed to produce this much gasoline.

The U.S. has sufficient natural gas, coal, municipal solid waste, and biomass waste, that if converted to "syngas," could produce enough "syncrude" to replace crude oil. The capital cost to set up facilities to produce this volume of syncrude is around a trillion dollars. The oil companies have a steady source of crude oil, so unless costs skyrocket, have little incentive to develop a syncrude economy. However, Exxon and Chevron have pursued hundreds, if not thousands, of patents in this space.

At a cost of around \$100 billion/year, the U.S. government could capitalize the syncrude production, and make us energy independent in 10 years. The gasification chemistry, Fischer-Tropsch chemistry, hydrocracking chemistry, and isomerization chemistry is well known, more so than any second-generation biofuel technology. Gasification permits one to produce the same products from different feedstocks, and all of these feedstocks are available domestically. Further, the feedstocks are available throughout the country, so we would be able to reduce the cost of shipping gasoline and similar products from the coastlines to the middle of the country.

In one step, the U.S. Government could provide clean energy jobs, revitalize clean coal technology and natural gas technology, create demand for tons of U.S. steel, create jobs for chemists and chemical engineers, and, in all likelihood, create a large number of government

jobs for those without health insurance. Demand for these products would likely continue for a very long time. If electric cars come into fashion, the syngas that is produced can also efficiently produce electricity. The syngas can likely be stored more easily (directly, or through conversion to other chemicals) than sunlight.

The syncrude-generating processes could use sugar cane bagasse from Louisiana, corn stover from the midwestern states, algae from algae-to-biodiesel processes, wherever they are conducted, coal from Kentucky and Montana, and landfill waste from all over the country. The result would be energy independence, job creation in rural areas, revitalization of the steel industry, and, ideally, creation of jobs that come with good health care benefits. By selling syncrude and other products to the oil companies at a fair price, we could avoid transferring wealth to the Mid-East, and use the proceeds to pay down the national debt. A shift of a few hundred billion dollars a year from going overseas, to staying in the U.S., can make a big difference.

The government has considered public/private enterprises, and has considered raising taxes without providing additional services to those paying the higher taxes (choosing instead to "spread the wealth around"). If the government charged higher taxes, but used the extra tax money to fund the public/private enterprise, and provide partial ownership to those who actually paid taxes, the wealthy might actually support the higher taxes. Thus, the government could use the power of taxation to force investment in a technology to make us energy independent, and create jobs that will be in demand for years to come, without raising the deficit one dime.

ScienceTeachCorp

Establish a passion for math and science by developing and promoting a "PeaceCorp" similar initiative. Each current engineering, science and math graduate should identify one child to encourage each year and in only five years we will have a wave of new interest.

Building a Sustainable Future

There are very few real developmental ideas noted such as two-cycle fuels or biobased coatings and insulation materials

Share resources in a translational pipeline

Allow researchers in different fields to work on each step in a translational project with an overarching coordinator that defines each step

Create collaborators open forum

Allow individuals with diverse super skills to work together on problems. i.e. clinical doctors, nanotechnologists, biochemists, molecular biologists etc. This should be on a website with an open forum access.

Simplify NIH grant proposals

Create an auction site or voting site for NIH grants

Transportation and agriculture

I would like to ask President Obama to include in his economic recovery planning more technology dedicated to fixing the US transportation system. I personally believe that lack of technology, roads, poor roads, and, in the large cities, traffic causes major loss of potential productivity that affect the economy. Furthermore, these problems are certainly universal in the US and, if fixed, would go a long way to build not only good infrastructure that is crucial for a better US economy, but also good will among all of the American people, for whom this is a basic major problem.

I also would like to ask the Obama Administration to focus greatly on investment in the agricultural sector as part of his economic recovery plan. I believe focus on this sector is crucial not only to economic recovery, particularly in the many areas of the country where agriculture is important but inefficient, but also to the end of poverty globally. For example, the US spends most of the food aid budget by sending basic grains abroad. However, certain populations, such as pregnant women and children, would benefit more greatly by having food that is tailored nutritionally toward their health needs. It is more expensive to send nutritionally targeted food (such as Plumpynut) than to send a bag of grains. As such, I was wondering if it would be possible for the FAS of the USDA to explore methodically how - within the current US agricultural economy - the US government could more cost-effectively meet these nutritional

needs. I could envision ways that the USG might encourage creativity and innovation within US agriculture to provide for this more nutritious food aid. As it is, a couple of (small) US entities are already entering this market, working to get legal rights to manufacturing a Plumpynut substitute. Therefore, I ask President Obama to look into initiatives such as these that would be good for US agricultural, particularly for small producers who will be untenable in current circumstances. It would open up a new sector, and help people overseas that need better food aid. Thank you very much

Establish a Permanent Panel or Program to Address Global Catastrophic Risks, Including AGI

Currently there is no government panel or program to address global catastrophic risks including human extinction risks ("existential risks"), collect proactive solutions to prevent extinction-scale disasters or provide resilience in the face of less severe global catastrophes, and help coordinate (inter)governmental initiatives to reduce the likelihood and severity of extinction threats, including providing research grants. One significant threat to the future of humanity that has received inadequate governmental attention (virtually none) is the development of a human-indifferent artificial general intelligence that can alter its own source code to become "superintelligent" or smarter than any group of humans in multiple domains. Please note that these are a different set of issues than those covered in the Nano-Bio-Info-Cogno (NBIC) Convergence events, though it also encompasses information tech, nanotech, and biotech. Some institutions currently addressing such risks from which panel members might be drawn include the Future of Humanity Institute at Oxford U. (http://www.fhi.ox.ac.uk/research/global_catastrophic_risks), The Singularity Institute for Artificial Intelligence (<http://singinst.org/aboutus/ourmission>), and the Institute for Ethics and Emerging Technologies (<http://ieet.org/index.php/IEET/about>). If we get global catastrophic risks wrong there might not be a future for humanity, period

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International Forum on Cancer, Materials Science and Nanotechnology

On July 15, 2010 at 8:00 am (Los Angeles) the Egyptian Cultural and Educational Bureau is holding a videoconference, entitled "International Forum on Cancer, Materials Science and Nanotechnology." The videoconference is a prelude to 2011 US-Egypt Year of Science. Other venues include Cairo University, UCLA, University of Texas Health Science Center and Georgia Institute of Technology.

Agenda

11:00 am (Washington, DC)

Egyptian Cultural and Educational Bureau—Maha M. Kamel, MD, PhD, Director, moderator

National Cancer Institute Health—Piotr Grodzinski, PhD, Chairman, NCI's Nanotechnology Alliance, speaker

University of Texas Health Science Center—Mauro Ferrari, PhD, speaker

11:30 am (Washington, DC): CNSI Auditorium at UCLA

CNSI (UCLA)—Paul S. Weiss, PhD, Director, speaker

CNSI (UCLA)—Jeffrey I. Zink, PhD, speaker

CNSI (UCLA)—Fuyu Tamanoi, PhD, speaker

12:00 noon (Washington, DC):

Georgia Institute of Technology—Mostafa A. El-Sayed, PhD, speaker

Civilian's Research and Education Foundation—Eric J. Novotny, PhD, Senior Vice President, speaker

12:30 pm (Washington, DC):

Cairo University—Abdel Rahman Vikri, PhD, President, National Cancer Institute (Egypt), speaker

Cairo University—Ahmed Galal Helmy, PhD, Dean of the Faculty of Science, speaker

Future titles for videoconferences include:

Materials Science Applications to Archaeology with a focus on the Valley of the Queens

Entertainment Technology for Cinema and Ancient Egypt

Re-Establish Solution Architecture Innovation Lab (SAIL) in support of innovators

The concept of a virtual Solution Architecture Innovation Lab (SAIL) was created by a group of non-profits, universities and federal agencies seeking to improve the governments ability to embrace innovative solutions and small businesses who are often left out of the federal IT acquisition process. With 95% of all major IT contracts going to the top 6 defense contractors, small innovative companies and open source developers are left out of the equation. Given the estimated \$200Billion spent each year on IT, and nearly half spent on needless custom development, having a virtual lab where key decision makers can explore "the realm of the possible" and better direct their prime contractors in embracing these innovative solutions.

SAIL has been operationalized by the Interop. Clearinghouse, a govt chartered non-profit created to capture interoperable processes and technical solutions already proven in the market.

This concept was first embraced in the early 90s via a project called Highway 1, and is needed again if the US is going to regain its technical leadership in the world.

Virtual Reality / Internet Crowdsourcing for Participatory Experimentation / Invention in Science and Technology.

Information, data, the latest experiments/research should not be secretly restricted to industry or academics/universities. There should be an open-source attitude to emerging technology and science thereby allowing members of the public to remotely (virtually) participate. There is a great untapped resource in the millions of minds within our civilization. For one reason or another not everyone has been university educated regarding science and technology therefore they've been unable to get a job working in the field of cutting-edge science and technology. Despite a lack of scientific education many unqualified people are very inventive; they possess sharp minds. People of all ages and from all walks of life could make valuable contributions to scientific and technological research. Experiments could easily be presented online in a manner allowing the vast majority of the general public to comprehend and thereby contribute. Fully immersive virtual reality would be the preferable medium for this proposed "crowdsourcing participation" but the internet in its current state would be adequate to allow great strides forward technologically, socially, and economically.

The role of the Government is to facilitate open communication, interaction, participation, and sharing between businesses, universities, and the general public.

LINKS REGARDING EMERGING VIRTUAL REALITY

<http://singularityhub.com/2010/07/02/presentation-for-minority-report-interface-that-blew-peoples-minds-at-ted-video/>

<http://oblong.com/>

<http://www.physorg.com/news197186879.html>

http://www.informationweek.com/news/security/client/showArticle.jhtml?articleID=225702022&cid=RSSfeed_IWK_News

[davisje](#) said:

Many of us, especially retired scientists, cannot afford to subscribe to scientific journals, and we live too far from university libraries to keep up in our former fields of expertise. I firmly believe that us "old codgers" still could contribute, if we had access to the latest literature in our fields.

I think that the proposed idea could go a long way in alleviating this problem

EDA/SBA Matching Grant Program to Foster Commercialization through Venture Capital

Create a new matching venture capital program jointly administered by the EDA and SBA. The goal of the fund would be to foster commercialization for specific technologies that could serve national needs (e.g. energy independence, high performance buildings, IT, biotech, health care innovation etc.). Venture capital groups would apply to the EDA/SBA and could be awarded matching funds for commercialization of promising technologies.

Explore proposals for sustaining the economy despite ubiquitous automation

The book, "The Lights in the Tunnel," addresses the issue of an ever increasing percentage of jobs being lost to automation. The basic thesis is that the trend toward lost jobs will only continue to accelerate and many of the "green collar" jobs will be one-time building and installation work; therefore, a fundamental change will be needed to sustain markets and consumerism so that we do not revert back to a feudal economy where only the wealthy corporations trade with each other: companies will need to be taxed for much of the profits accrued by innovative automation technology and the proceeds should be given back to the public in meritocratic, pro-social ways that also foster the advancement of science, technology,

and innovation and the sustaining of markets via inclusive consumerism. Money could be granted for people to further their education, especially in the areas of science, technology, business, and a wide array of "open-source innovation" projects, including community building efforts. America still has the market to sustain business interest, and will continue to sustain business interest as long as most citizens can remain active consumers (ones increasingly rewarded for pro-social investments). The Obama administration can make this necessary revolution happen before the economy crashes again in an dramatic, unsustainable boom-bust cycle. Business-as-usual no longer will be sufficient to sustain our markets this decade.
<http://www.thelightsinthetunnel.com/>

Research the primary cause of degenerative diseases: aging / biological senescence

At present a sum of 457.2 billion dollars is devoted to U.S. health care. Much of that money is devoted to researching late-stage progressive diseases associated with biological senescence that comes with increases in chronological age. A small fraction of that money, say one million dollars over ten years, could be redirected to biotechnology / information technology companies advancing legitimate science and technology that could slow and eventually halt the biological degradation of human aging, resulting in immense reductions in health care costs and a significantly healthier workforce. The Obama administration has the opportunity to advance the pace of this revolution considerably this term or next term with a relatively modest fiscal allocation to research and development coordinated by the SENS Foundation (Strategies for Engineering Negligible Senescence) (<http://www.sens.org>) and the Methuselah Foundation (<http://www.mprize.org>). Again, the result would be a healthier workforce and drastically reduced health care costs.

[Community Member](#) said:

I can't think of an area of research more drastically important than this one. This is something that applies to everyone

Build on existing programs and public-private partnerships

Tech Transfer and SBIR projects often get stalled bridging the "valley of death" from product concept to design, prototype, test/qualify, manufacture, and commercialize. The government funds R&D but not the essential steps along the commercialization pathway. Why not focus more government support on promising SBIR Phase II technologies, providing funding for market and technical feasibility studies and in-depth commercialization planning for those

products and technologies that demonstrate the greatest promise for market acceptance. Profit and jobs are not created until products are manufactured, commercialized and sold in the marketplace.

Organic food and a healthier America

I encourage support for organic farmers which in turn will bring prices down so more people can buy it, resulting in a healthier American people which leads to a strong economy through right ecology. Thank you.

Fundamental research

The private sector is driven by commercialization of near-term technology development, and understandably reserves research resources for applied research. The government is the only source of support for fundamental research, the research that lays the foundation for future discovery and unforeseen innovations. Government research is becoming too enthralled with applied (buzz word "transformational") research, and needs to maintain support for fundamental research as the priority. This is so across the physical and life sciences.