

TECHNOLOGY TRANSFER PROGRAM

BRINGING NASA TECHNOLOGY DOWN TO EARTH

T2 Status and Initiatives Briefing to NASA Advisory Counsel

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Office of the Chief Technologist
April 7, 2015

Outline

- **Legislative Authority**
- **Program Overview**
 - New Technology Reporting
 - Patenting and Portfolio Management
 - Licensing
 - Software Release
- **Products**
 - NASA Tech Briefs
 - Digital Outreach
 - Spinoff
- **Technology Transfer University (T2U)**
- **Summary**
- **FY2015 Program Plan**

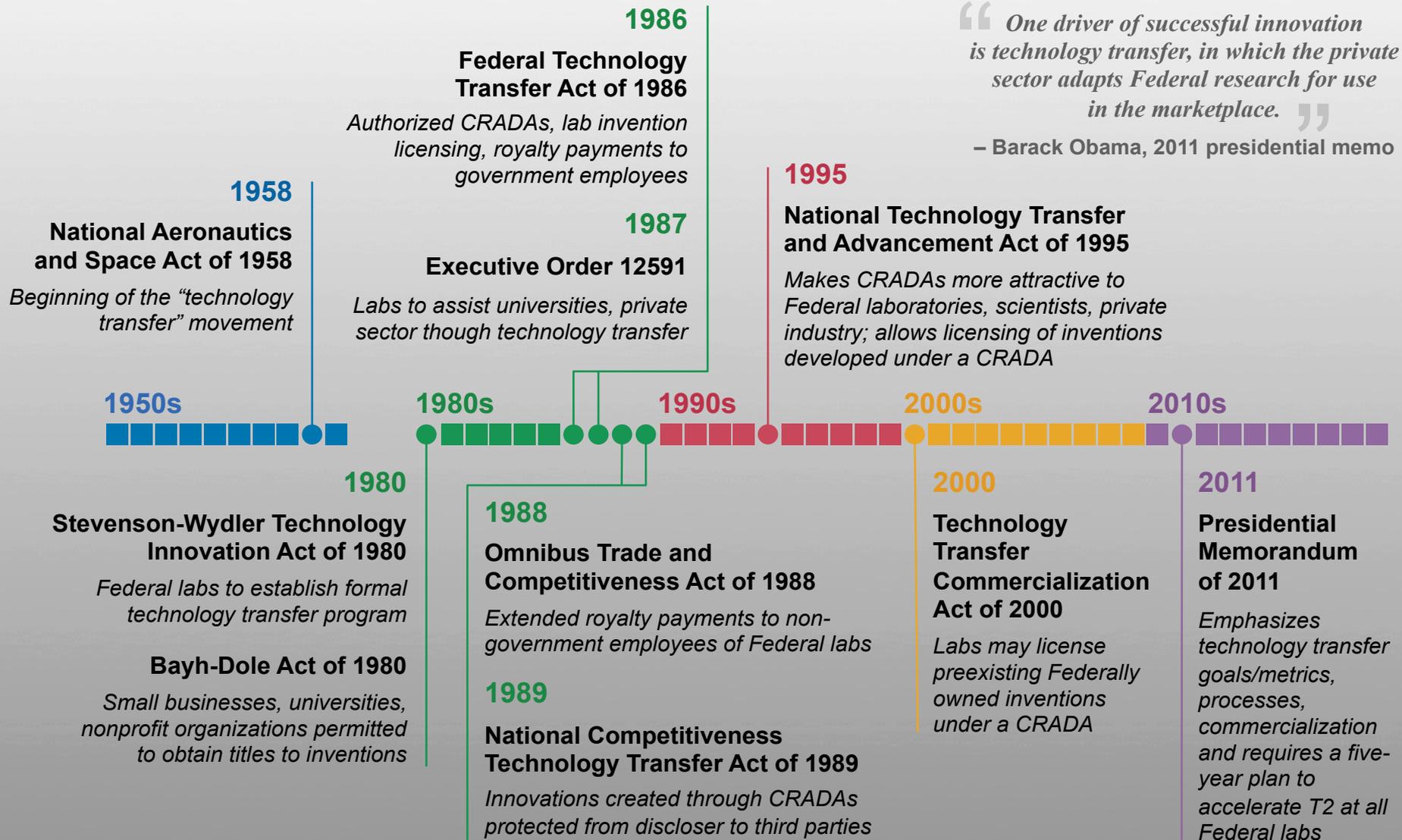


Juntura Group licensed the Inductive Position Sensor from Kennedy Space Center, a result of the T2U partnership with Rollins College.



T2P Face-to-Face Meeting at SSC (Atop the A1 Test Stand) in September 2014

T2 Authority and Emphasis



FY2014 T2 Program Overview



Our budget is down, but our metrics are **up**.

We're learning to do **more** with less by working together.

The Technology Transfer Program is:

- Working together to streamline and automate as many activities as possible;
- Creating a seamless and integrated way for the outside world to interact with NASA; and
- Minimizing competition between the NASA field centers in order to work as a coordinated, strategic and intentional program.



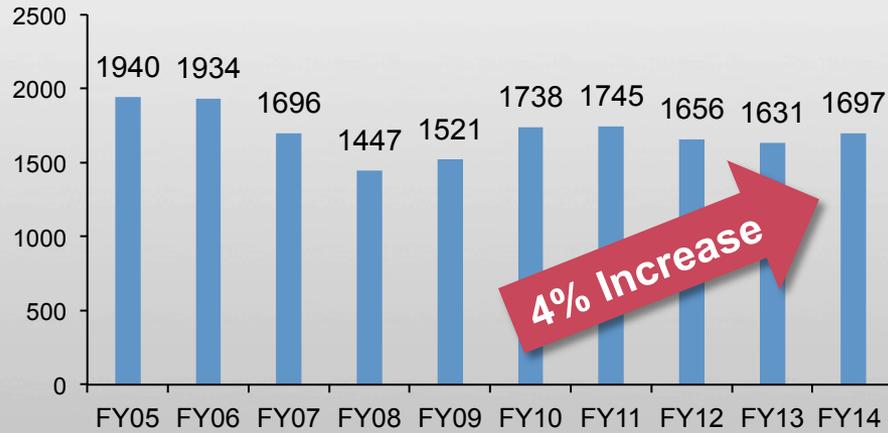
T2P Face-to-Face Meeting at Stennis Space Center (Historic A1 Test Stand Flame Bucket) in September 2014.

FY2014 T2 Program Activity Summary



New Technology Reporting (NTRs)

NTR Trend – Total



- **4% Increase** in Total NTRs
- **9% Increase** in Small Business NTRs
- **4% Increase** in NTRs with Government Inventorship

NTRs from Small Businesses Trend



NTRs with Government Inventorship Trend



New Technology Reporting (NTRs)

- Created NTR Awareness and Training Best Practices Sharepoint site
- Developed a Desk Reference Guide for New Technology Reps. This document:
 - explains the laws and regulations which direct the reporting of new technology reporting
 - explains contract compliance
 - describes the activities and processes which are involved in new technology reporting and contract compliance
- Made considerable progress toward clarifying reporting requirements for small business contractors. Working with NSSC, Office of Procurement, and SBIR
- Conducted 120 NTR Training Sessions

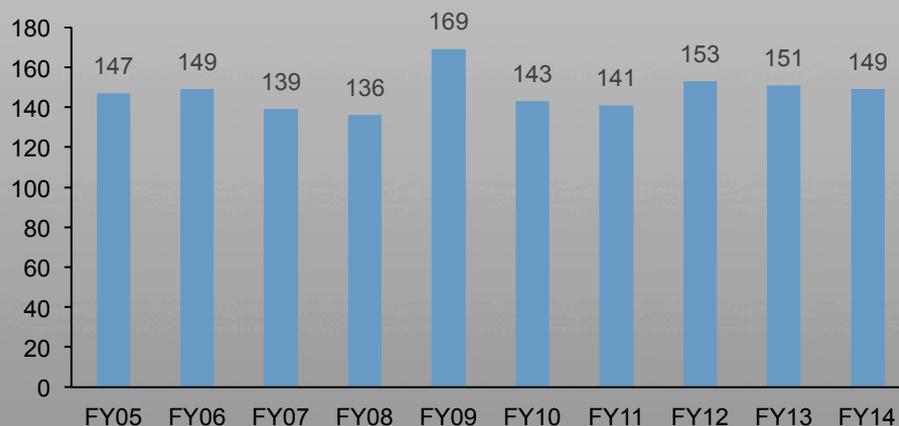


US Patents Issued

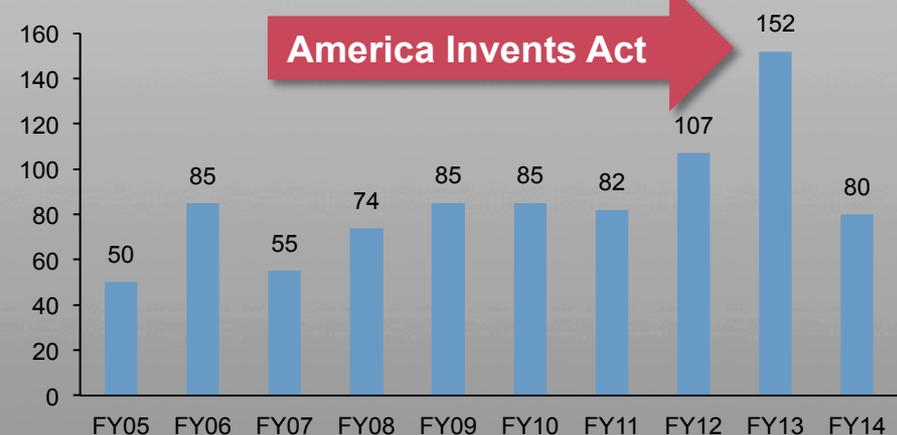


- New patent strategy released by OGC/T2 in March 2014 emphasizes commercial potential in patenting decisions
- Provisional Patent applications surged in FY13 prior to the March 2013 effective date of the America Invents Act, “First to File”
- OGC’s USPTO account that pays for patent filings and maintenance fees was slashed and restored in FY14 – budget seems stable for FY15

US Patent Applications Filed

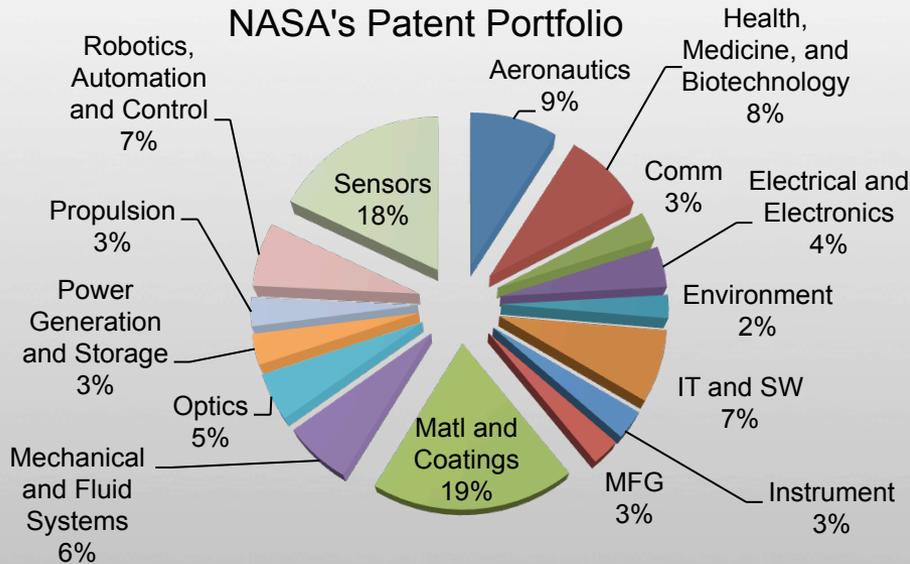


US Provisional Applications



NASA Patent Portfolio Analysis

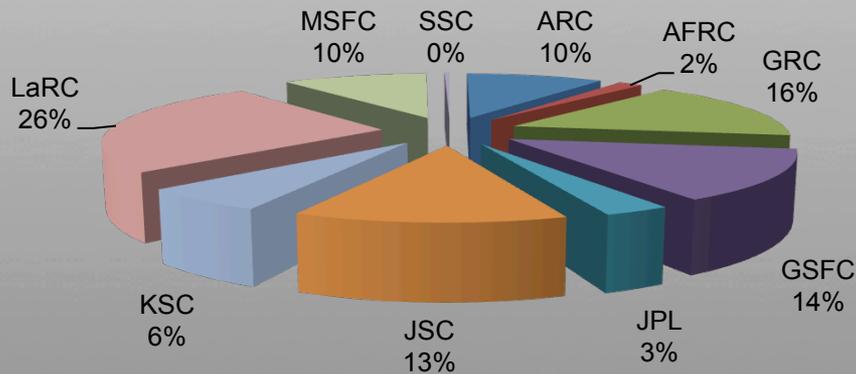
NASA's Patent Portfolio



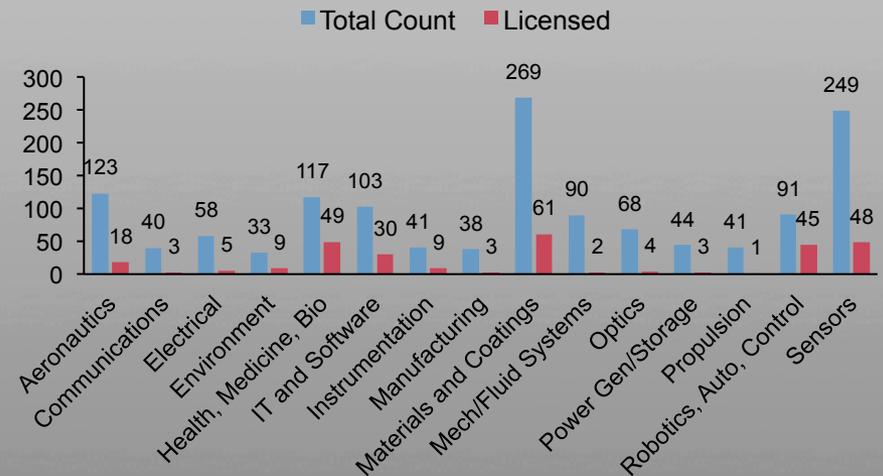
Accomplishments

- Conducted a study on how best to strategically manage the NASA Intellectual Property Portfolio. Results were briefed to the T2 managers and OGC in June at GRC.
- Released policy guidance on patent decision-making
- Analyzed and evaluated the Agency's Patent Portfolio: technology bins, TRL, coordinated marketing strategy, standardized marketing collateral (e.g. icons, color palette and TOPS)
- Evaluated several state-of-the-art portfolio analysis tools to understand the value of NASA patents

Portfolio Contribution by Center



Licensed Patents by Technology Category



Patent Portfolio Marketing Collateral



New Patent Portfolio Bin Icons and Color Palette

Bringing NASA Technology Down to Earth




Information Technology and Software

NETMARK

An advanced XML database integration technique for managing unstructured documents

NETMARK offers for license to NETMARK software, a unique innovation designed to seamlessly integrate structured, semi-structured, and unstructured data and documents across enterprise organizations. Originally developed to integrate the vast quantities of samples, heterogeneous documents existing within NASA, this schema-less integration technique and framework offers a highly scalable, open enterprise database architecture that eliminates or reduces the need for database design and administration, and converts information from a wide range of data types into a single, universal data type for storage, retrieval, and content and content sensitive query and access. A production-ready, enterprise-level application, NETMARK quickly assimilates and retrieves gigabytes of disparate information and can be easily integrated with existing applications as well as accommodate new data formats - allowing the legacy data retrieval while balancing query workload in diverse applications.

BENEFITS

- Event-driven - addresses the need to design, develop, and maintain separate, highly structured relational databases, leaving both software and administration tasks.
- Flexible - combines information from heterogeneous structured, semi-structured, and unstructured data sources, and enables easy and unobstructed data queries.
- Adaptable - enables query-based conceptualization of environments that support big and huge protocols.
- Secure - highly query results to the information that users and groups have permission to access.
- Custom - includes configurable elements for tailored query workload in diverse applications.

technology solution

www.nasa.gov

NASA Technology Transfer Program
Bringing NASA Technology Down to Earth

THE TECHNOLOGY

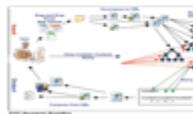
NETMARK offers advantages of an object-oriented model and the efficient XQuery language. NETMARK enables data to be accessed, retrieved, processed, and dynamically generated without reliance on traditional database and/or other relational database management systems. NETMARK offers XQuery, a standard query language that allows for the use of data in its native, unstructured form. NETMARK offers a rich set of data types for representing unstructured data types, including text, images, audio, video, and other data types. NETMARK offers a rich set of data types for representing unstructured data types, including text, images, audio, video, and other data types. NETMARK offers a rich set of data types for representing unstructured data types, including text, images, audio, video, and other data types.

APPLICATIONS

- Enterprise knowledge management applications
- Document and content management systems

PUBLICATIONS

"Managing Unstructured Data With XQuery" by Robert H. Taylor, NASA, DOI: 10.1109/ICDM.2006.100



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New Automated TOPS Template in NTTS Relational Database System




Robotics, Automation and Control

Robonaut 2 Technologies

For use in logistics and distribution, medical and industrial robotics, and hazardous, toxic, or remote

Researchers at NASA's Johnson Space Center (JSC), in collaboration with General Atomics and Unmanned Systems, have designed a state-of-the-art, highly dexterous, humanoid robot, Robonaut 2 (R2). R2 is made up of multiple component technologies and systems - robot systems, image recognition systems, sensor integration, motion control algorithms, and much more. R2's nearly 100 patented and patent-pending technologies have the potential to be given changes in multiple industries, including logistics and distribution, medical and industrial robotics, as well as hazardous, toxic, or remote environments.

BENEFITS

- Diverse tasks
- Touch sensitive
- Able to navigate around obstacles
- Environmentally sensitive
- Mobile
- Capable of task flexibility
- Able to work in possibly toxic environments

technology solution

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Bringing NASA Technology Down to Earth

THE TECHNOLOGY

While robotic technologies are already being used in a number of industries, the highly dexterous, R2 offers a new level of automation. In terms of handling accuracy, R2's dexterity is on par with a human's, and its ability to perform a wide range of tasks is on par with a human's. R2 is designed to be used in a wide range of environments, including hazardous, toxic, or remote environments. R2 is designed to be used in a wide range of environments, including hazardous, toxic, or remote environments. R2 is designed to be used in a wide range of environments, including hazardous, toxic, or remote environments.

APPLICATIONS

- Logistics and distribution - allows for much more complex and delicate operations that require a more sophisticated level of interaction
- Industrial - can operate equipment and machines designed for humans, the skills or talents
- Medical - can handle time-consuming tasks of learning, writing, interpreting, and processing
- Hazardous, toxic, or remote environments - can be an invaluable tool for land mine detection, bomb disposal, waste recycling, and more

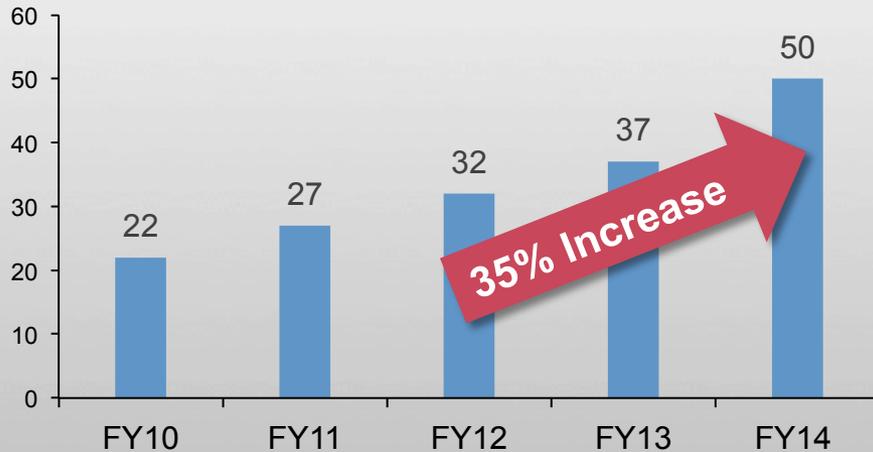


R2 can do all of these things with its skills with humans. The robot moves with human speed, is able to self-learn and self-improve, and can operate through the safety systems that are built into the robot. R2 is designed to be used in a wide range of environments, including hazardous, toxic, or remote environments. R2 is designed to be used in a wide range of environments, including hazardous, toxic, or remote environments. R2 is designed to be used in a wide range of environments, including hazardous, toxic, or remote environments.

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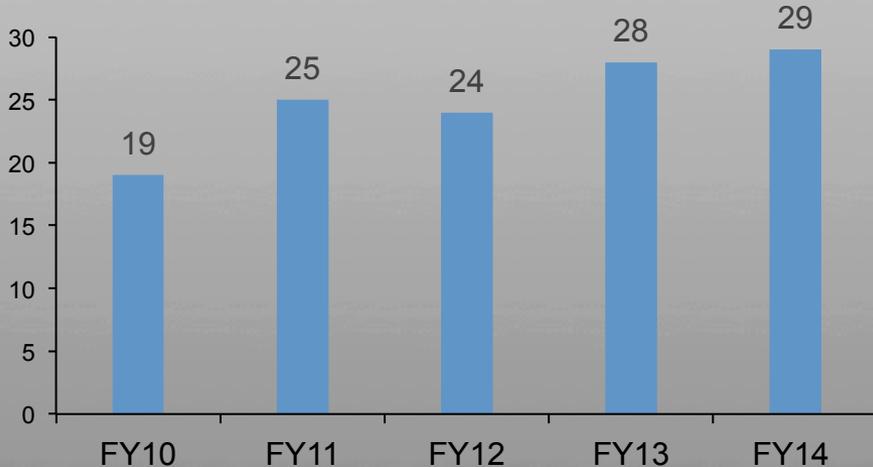
New Patent Licenses

New Licenses Executed (Total)

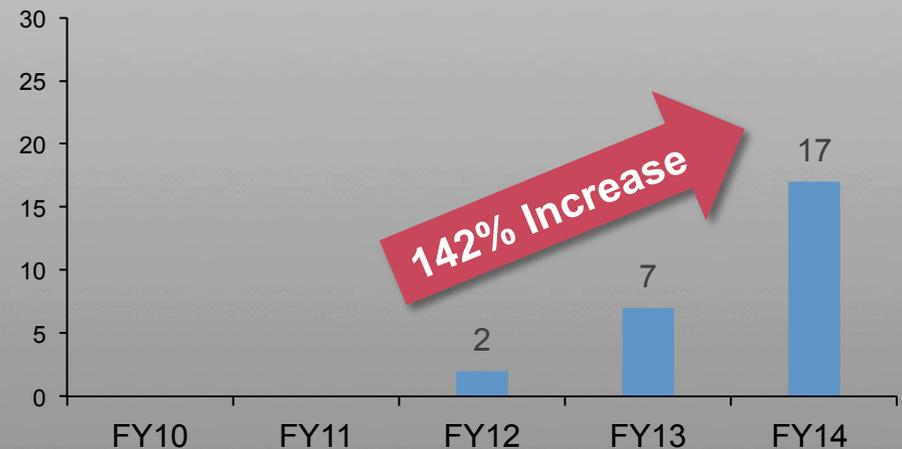


- Emphasis on Evaluation Licenses in FY14 resulted in a **142% increase** over last fiscal year
- Overall **35% increase** in Licensing for the agency!

New Commercial Licenses Executed



New Evaluation Licenses Executed



Innovative Licensing Approaches

In addition to the traditional methods of reaching potential new licensees, like direct marketing to companies and working the floors at conferences and exhibits, we have piloted several new and innovative approaches.



Marblar

1 license

Through a partnership with the OCT Prizes and Challenges Program, Marshall contracted with Marblar Ltd to place 38 NASA technologies on their crowd sourcing platform. The result was significant public exposure, resulting in one commercial license. Marblar has since abandoned its crowd sourcing business and is now commercializing NASA technology.



EdisonNation

Ongoing

Langley partnered with Edison Nation to place a set of their patents on that company's crowd sourcing platform. Ongoing, but early results suggest multiple commercial licenses may result.



QuickLaunch

Ongoing, 6 licenses to date

This year we grew and expanded the QuickLaunch licensing platform, where companies can license use of a NASA technology in a matter of days (credit card for fees, non negotiated, nonexclusive). 2X increase in content, with plans to grow more in FY 2015. Broadening the types of agreements and terms. Resulted in 6 licenses.



StartupQuest

2 licenses

The T2P provided an Agency-level response to a regional entrepreneurial training initiative resulting in two executed patent license agreements. Learned that we need to build a program infrastructure that allows us to be more responsive to these technology-specific calls from across the agency.

New Software Releases

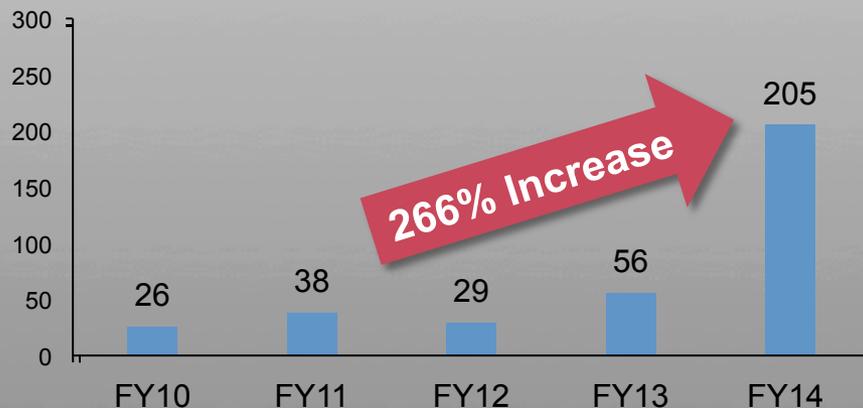
New Software Usage Agreements (Total)



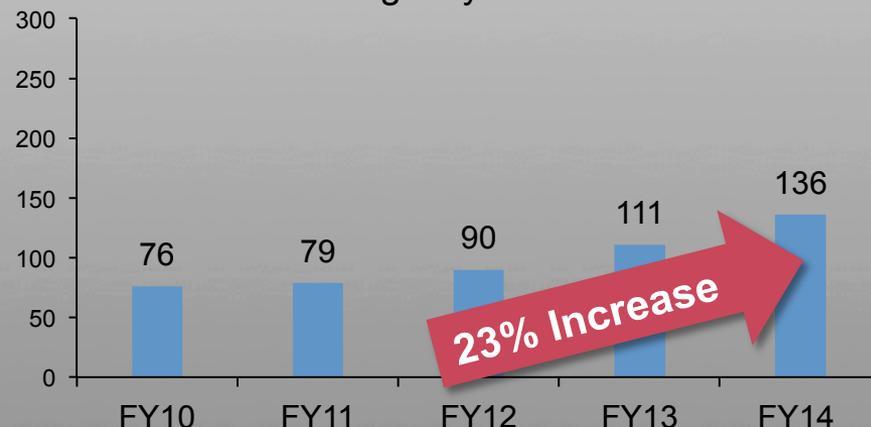
- **18% Increase** in Agency Software Releases
- **266% Increase** in Public Domain Software Releases
- **23% Increase** in Interagency Software Releases

Highest levels in 5 Fiscal Years!

New Software Usage Agreements Public Domain Release



New Software Usage Agreements Interagency Release



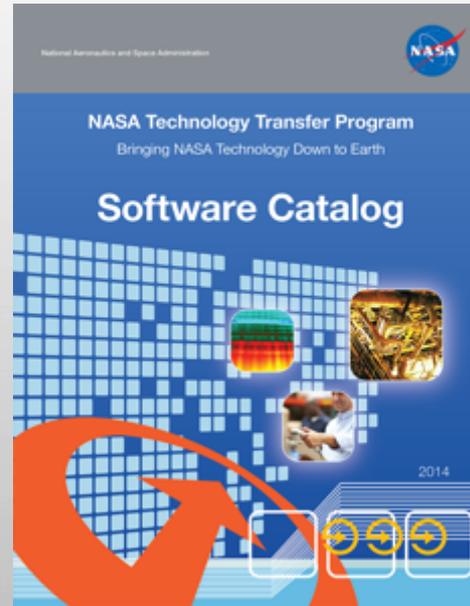
Software Release

Software is an increasingly important area for tech transfer

- 30% of all reported NASA inventions are software
- SUAs topped 1,600 in 2014

The software catalog provides a single access point for locating NASA-developed software

- The catalog is the first of its kind in the US Government
- Released April 2014
- 1000+ codes/tools from all field centers
- Updated daily
- Featured in Wired Magazine, Newsweek, Gizmodo, and 50+ other publications
- Praise from White House
- 2015 plan to build an Agency software repository
- 2015 edition of the catalog will be released in April



Software Release Authority Working Group Face-to-Face Meeting at Marshall Space Flight Center (U.S. Space & Rocket Center) in May 2014

T2 Outreach and Initiatives

- NASA Tech Briefs
- Digital Outreach

New T2 Portal Released
September 2014

Twitter

YouTube Channel

LinkedIn Showcase Page

- Spinoff
- Technology Transfer University (T2U)



Actor Seth Green visits JPL to film Tech Transfer Spinoff Video in March 2014



Booth at MSFC Technology Exposition held at the US Space & Rocket Center in October 2014

NTRs Sent to NTB

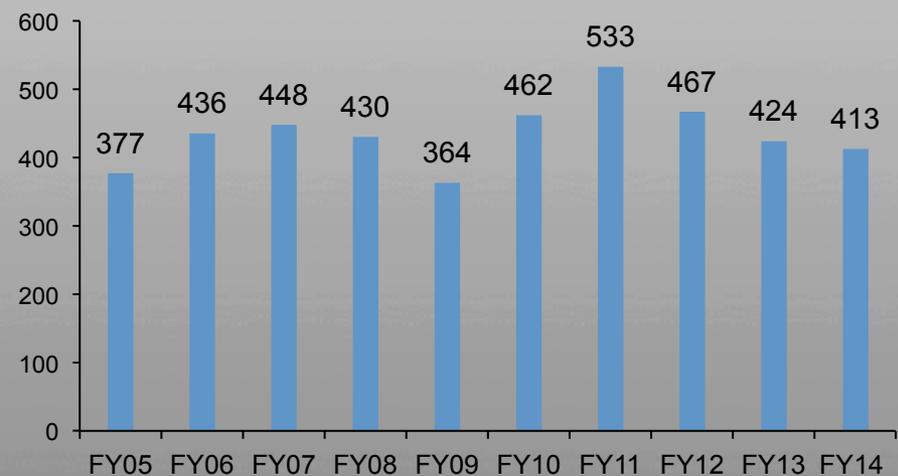


- FY14 emphasis on restoring NTB's inventory of NASA-approved articles for publication with priority on hardware
- **96% Increase** in NTRs sent to NTB for draft articles
- **26% Increase** in articles approved for publication by NASA sent to NTB

NASA-approved Articles Sent to NTB



NASA-approved Articles Published in NTB

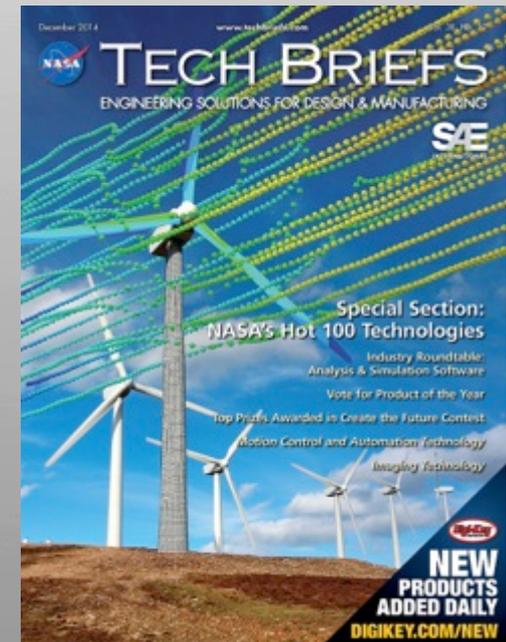


NASA Tech Briefs (NTB) Magazine

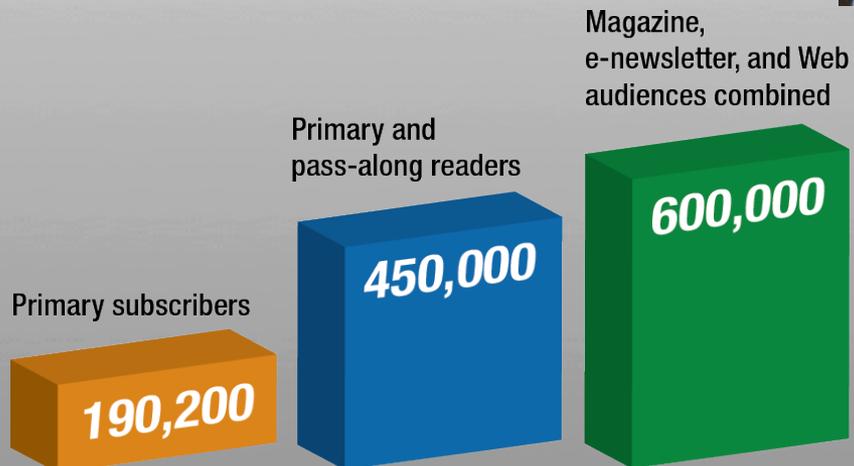
- Published monthly since 1976, the largest circulation design engineering publication in the world
- Approximately 400 technologies featured per year
- Print Circulation 190,000 plus
- Longstanding public-private partnership
- Saves government resources
- 14 technical seminar webinars; audience of over 6,000 reached



First 3D Printer in Space!



NASA Hot 100 Technologies



Publisher's data, March 2013

NASA T2P Digital Outreach



The screenshot shows the NASA Technology Transfer Program website. At the top, there are navigation links for NEWS, MISSIONS, MULTIMEDIA, CONNECT, and ABOUT NASA. Below this is a large banner with the program logo and the tagline "BRINGING NASA TECHNOLOGY DOWN TO EARTH". The main content area is divided into two columns. The left column features a "NASA Technology Transfer Features" section with a video player showing the Orion capsule and a search bar for NASA technologies. The right column has a "Welcome to the T2 Portal" section with a video player and a "Contact Us" section. At the bottom, there are social media icons for Twitter, YouTube, and LinkedIn.

New T2 Portal Released 9-15-14

Twitter, YouTube and LinkedIn sites

This block contains three screenshots of social media profiles. The top screenshot is a Twitter profile for "NASA Tech Transfer" (@NASA_T2P), showing tweets about software code sharing and a meeting with the Task Force. The middle screenshot is a YouTube channel page for "NASA Technology Transfer Portal", featuring a video of a diver underwater and a red and white rover. The bottom screenshot is a LinkedIn profile for the "NASA Technology Transfer Program", showing a list of followers and a description of the program's mission.



2015 Spinoff available January 15

- 44 companies located in 20 different states
- Transferring technology from 10 NASA field centers, NASA Headquarters, and NASA-funded facilities



Improved Calibration Shows Images' True Colors

NASA Technology

A satellite image, the waters of the Pearl River, which winds around NASA's Space Station, are shown in the same brownish green color of waterways the world over. It's easy to tell, the water in the center's small, round reservoir is much darker. Chalk up, though, that these images do not capture the precise, true color of other bits of water, or anything else they depict.

Radiometric calibration, which improves the color accuracy of an image and enables it to be used to solve various imaging problems, has always been a costly endeavor. A comprehensive effort between Boeing and Innovative Imaging and Research Corporation (IIR), a small business located in the center's campus in southern Mississippi, is changing that.

"What's only been possible in a computerized radiometric calibration facility, now anyone can do it," says Tom Stankay, who manages the Small Business Innovation

Research (SIBIR) and Small Business Technology Transfer (STTR) programs at Boeing.

"This is because IIR has built a better—and more efficient, and cheaper—imaging system.

An imaging system is a hollow globe whose internal surface is coated with a highly reflective white coating that diffuses light evenly in all directions. The result is a

uniform glow with no discernible features, which, Stankay says, "gives you a disorienting feeling looking into it."

It's this blank uniformity that allows the operator to know that when a camera looks into the system, primarily the same wavelengths of light are hitting every point in the camera's field of view with equal intensity. "Then, the consistency of each of the individual photodiodes in the camera is adjusted until the resulting image reproduces the uniform field of light in the imaging system.

Integrating systems have historically been fit using long-arm halogen lamps, whose point-to-point geometry is prone to produce subtle distortions, which is important for very, very radiometric calibration. The problem is that lighting a large system with that approach requires an enormous amount of energy and large exposure times.

The construction of the system has also been costly," Stankay says. "The big system are tens of thousands of



dollars, and a system that's a meter or more in diameter can cost more than \$100,000."

However, having a large integrating sphere can pay off when calibrating complex camera arrangements, such as those used for aerial mapping. "There can be tens of light camera modules, each providing different colors or wavelengths of coverage. To calibrate them all at once, the sphere might need a pair of million-dollar lenses to reflect across or target the camera assembly to back through. But the bigger the part, the larger the sphere has to be, so the light inside will lose its uniformity."

One system is to take the camera arrangement apart, calibrate one camera module at a time, and then reassemble it. However, Stankay says, this is time-consuming and expensive. A follow-up generation calibration is under way to make sure the assembled system all lines up perfectly. "You don't want a whole bunch of money on the back end by not having to disassemble and reassemble and maintain," he says.

Another complication with traditional integrating spheres is that integrator halogens and pinholes can "bump" deposits internally quickly over time, which becomes a

lighting technology, which is difficult and expensive to construct, from thousands of small, individually laser-etched photodiode segments, to light capture, acquisition, storage, and processing. IIR was able to ultimately lower the cost and improve the accuracy of the radiometric calibration system by using a hollow globe whose internal surface is coated with a highly reflective white coating that diffuses light evenly in all directions.



148 | Industrial Productivity

Spinoff 2014

Spinoff 2014

Industrial Productivity | 149

 Companies profiled in Spinoff 2015

Spinoff Communication Products

Website

- Tens to hundreds of thousands of unique monthly visitors
- Database containing ~2,000 spinoff technologies

Spinoff ancillary products

- Annual iPad version of the book one of the first and most feature-rich of NASA iPad publications
- Print brochure for each year's book, containing story summaries, hugely popular among centers as a handout
- Shortened versions of *Spinoff* stories appear as web features on T2P, *Technology Innovation*, OCT website, and elsewhere

Flyers and brochures

- Flyers for timely events, e.g., Orion test flight

Social Media

- Twitter: 43k followers, content receives retweets by @NASA account
- Facebook: 78k followers, engages tens of thousands of unique users each week

Celebrity PSAs

- Videos receive support from agency-level social media accounts and are picked up by tech blogs and news outlets
- Recent videos feature Alex Trebek, William Shatner, Seth Green





T2U teaches business students about NASA's technology portfolio, allowing them to work with agency technology and inventors to discover new uses for the innovations in commercial applications.

- The students benefit from the interaction with real inventors, real technologies, and all-around real-world experience.
- Student teams may form start-up companies, licensing NASA-patented technologies
- NASA teaches thousands of potential entrepreneurs about the availability of taxpayer-funded technologies across the federal government



Summary

We are in year three of our five-year plan to accelerate T2

- Pursuing high-level goals contributing to agency-level objectives
- Our metrics reflect progress across the board
- We are working together to become more strategic and effective

We have developed new products

- Software Catalog
- New T2 Portal
- New standardized agency Technology Opportunity Sheets (TOPS)
- LinkedIn Showcase Page
- Detailed monthly metrics report for agency and centers
- Updated NPR 7500
- New Technology Reporting Desk Manual

We have even more ambitious plans for FY2015

- 18 goals across 7 objectives including:
 - Develop and populate Software Repository
 - Coordinate marketing collateral for agency patent portfolio
 - Modernize software release policy
 - Expand T2U

FY2015 T2 Annual Program Goals



Objective 1: Revise Agency Policy and Develop Strategy

- Goal 1a – Update NPR 2210.1C Release of NASA Software – MSFC/Taylor

Objective 2: Increase New Technology Reporting

- Goal 2a – Increase Reporting by Large Entity (LE) Contractors – HQ/Hall
- Goal 2b – Develop New Ways to Incentivize GE Innovators – ARC/Morse
- Goal 2c – Establish Methods for Determining the Percentage of Inventions Captured – KSC/Makufka
- Goal 2d – SBIR/STTR Contract Closeout project – GRC/Dalgleish-Miller
- Goal 2e – Grant and Cooperative Agreement Project – GRC/Dalgleish-Miller

Objective 3: Strategically Manage Intellectual Property

- Goal 3a – Strategic Use of USPTO Account – JSC/James
- Goal 3b – Portfolio Analysis for Industry Groupings and TRL – HQ/Hall

Objective 4: Market Agency Technology Assets

- Goal 4a – Develop Online Marketing Collateral for Every Patent Issued and Pending in the Portfolio – LaRC/Dezern
- Goal 4b – Develop and Execute Agency Marketing Campaign for Materials – LaRC/Dezern

Objective 5: Develop and Implement Innovative Methods for Technology Licensing

- Goal 5a – More Effective Licensing – KSC/Makufka
- ~~Goal 5b – Industry Specific Marketing – JPL/Graczyk~~ CANCELLED
- Goal 5c – New Innovative Methods for Increasing Licensing and Licensee Effectiveness – KSC/Makufka

Objective 6: Increase Software Releases

- Goal 6a – Implement Agency-wide Electronic Software Repository – MSFC/Taylor and ARC/Orans
- Goal 6b – Refresh the Software Catalog by April 9, 2015 – Taylor/MSFC

Objective 7: Advance T2 Partnerships

- Goal 7a – Implement "No Cost" Contracts for Partnership Intermediaries – HQ/Hall
- Goal 7b – Launch Technology Transfer University (T2U) – GSFC/Cheeks