GRAB THE FUTURE | LEVERAGING TECHNOLOGY TRENDS

IRI 2016 ANNUAL MEETING

MAY 23-26, 2016 | HILTON ORLANDO LAKE BUENA VISTA, ORLANDO, FL

How to build effective industry-federal lab partnerships

Organized by IRI's Federal Lab Activity Group (FLAG)

Ben Cook (Sandia) and Linda Ham (NASA), Co-Chairs
Joe Fox (Ashland), IRI Board Liaison

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Today's session

- Focus on partnering motivations and mechanisms
- Highlight partnership success stories
- Learn more about federal lab capabilities tonight

Today's lineup…

- Federal lab overview, Courtney Silverthorn, FLC/NIST
- Partnering perspectives panel followed by Q&A

Industry	Lab
Luc Adriaenssens, CommScope	Peter Christensen, PNNL
Gretchen Baier, Dow	Linda Ham, NASA
James Unterreiner, Shell	Thomas Mulkern, ARL

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Navigating the Landscape of the Federal Labs

Courtney Silverthorn, Ph.D.

National Institute of Standards and Technology

May 24, 2016

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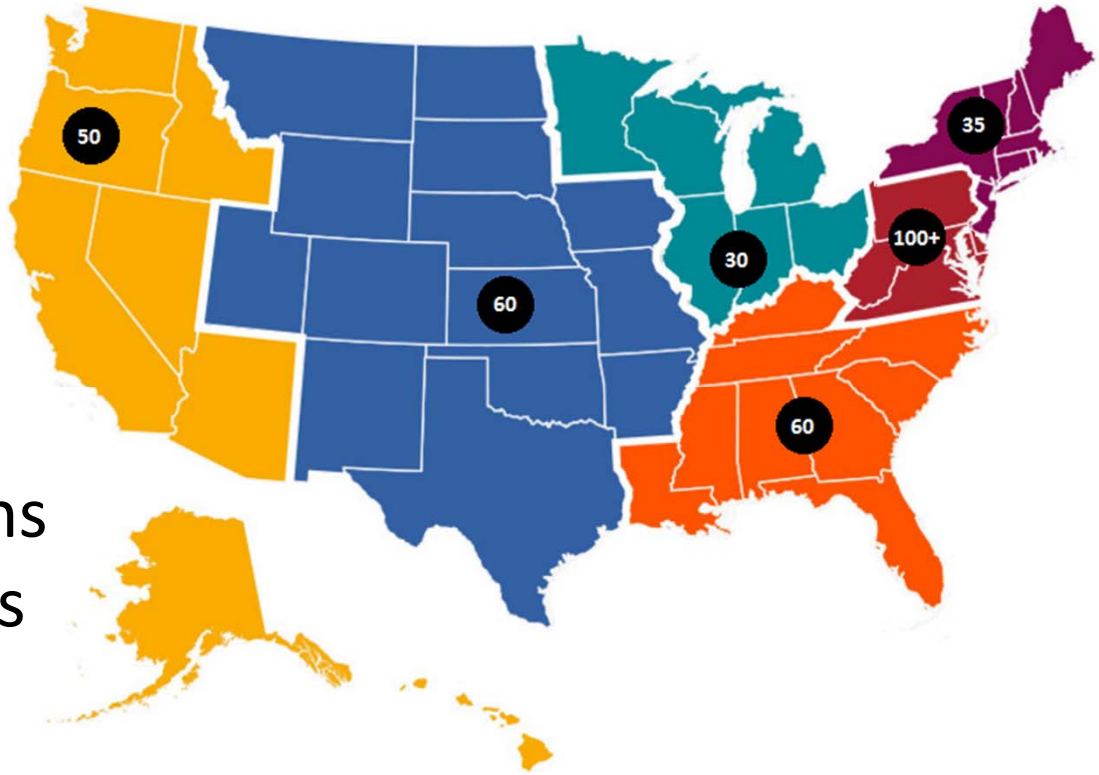
The Federal Laboratories



Access to
- Ideas
  - Inventions
    - Facilities

0.4% of our facilities…

US Forest Service Fire Test Lab

NIST Nanofabrication Facility

USAF Terahertz Spectroscopy Lab

PNNL Computational Science Facility

CDC Human Digital Modeling and Hand Scanning Lab

USCG Photonics Laboratory

Bureau of Reclamation Materials Engineering and Research Lab

FHA Coatings and Corrosion Lab

EPA Center for Hazardous Substances in Urban Environments

NASA JPL Robotic Vehicle Lab

NSF Institute for Systems Research Speech Communication Lab

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Ideas, Inventions, and Facilities

(aka Mechanisms in a Nutshell)

- Partnerships – Directed R&D, Collaborative R&D, Cooperative Research and Development Agreements

- Patents/Licenses – Exclusive, Non-Exclusive, Research Evaluation, Small Business

- Facility Use Agreements – proprietary, non-proprietary

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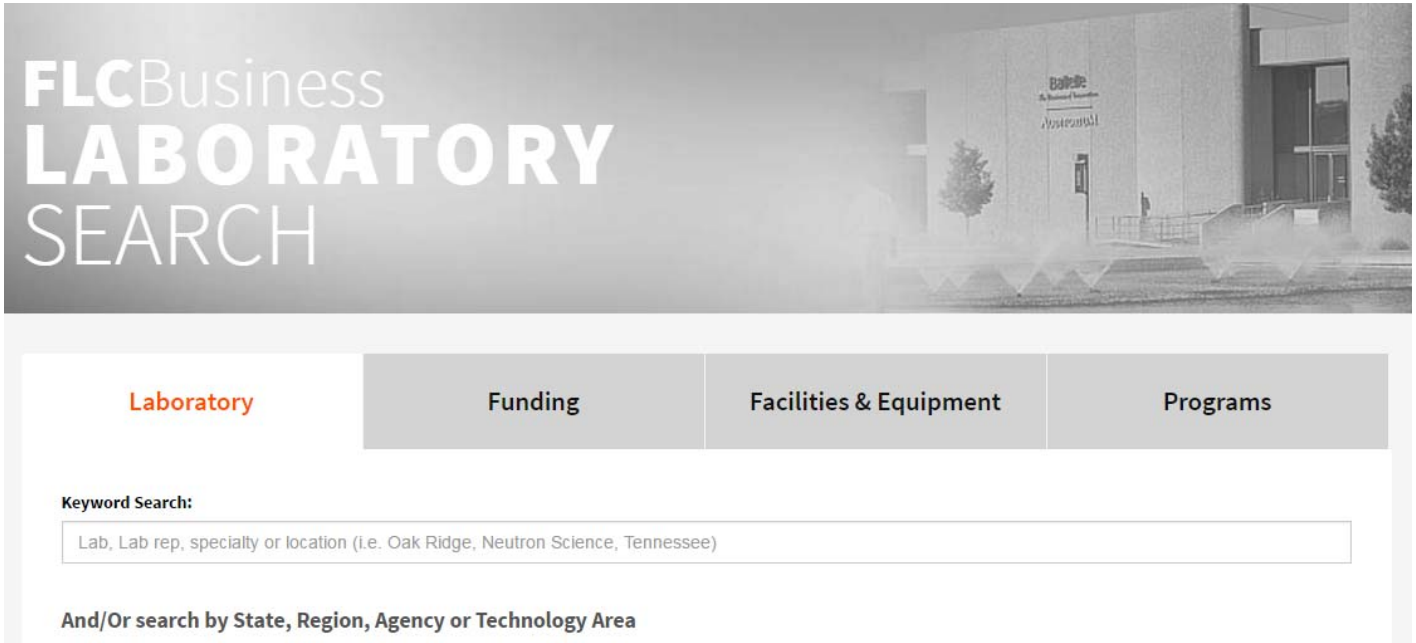
How can I find the right Federal Lab Partner?



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http://flcbusiness.federallabs.org

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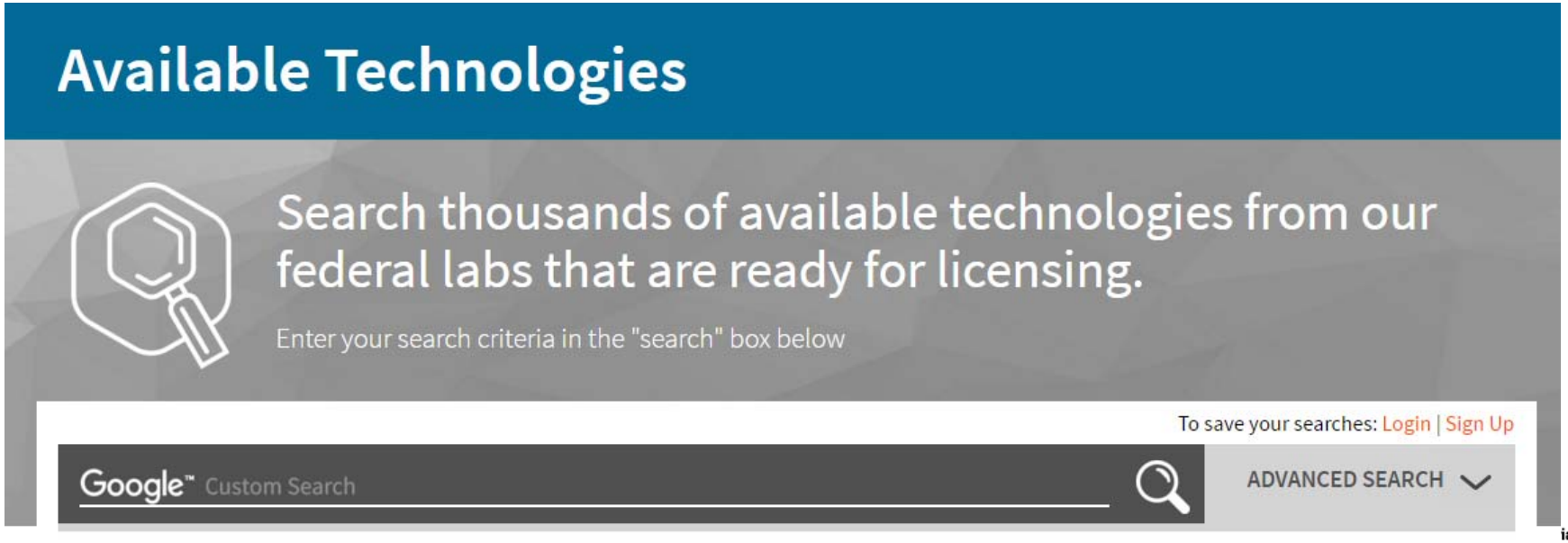

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http://federallabs.org/Available-Technologies

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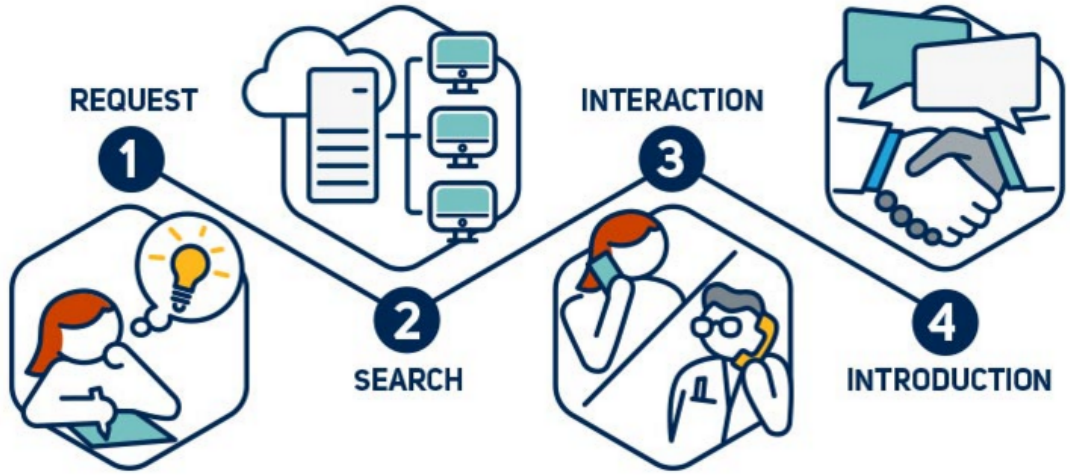
How can I find the right Federal Lab Partner?

How the Technology Locator Service Works



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http://federallabs.org/Technology-Locator

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Courtney Silverthorn, Ph.D.

Deputy Director, TPO

Host Agency Representative, FLC

courtney.silverthorn@nist.gov

301-975-4189

www.federallabs.org

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Our Experience Partnering with National Labs vs. Universities

Luc Adriaenssens

SVP of Technology, CommScope

5/24/16

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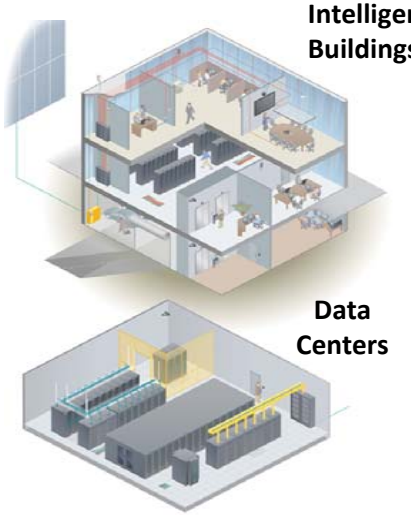
CommScope: Global leader in telecom infrastructure solutions

$5B rev, $1B OI, 25k employees, 10k patents, 30 mfg facilities, 14% CAGR ('05-'16e)

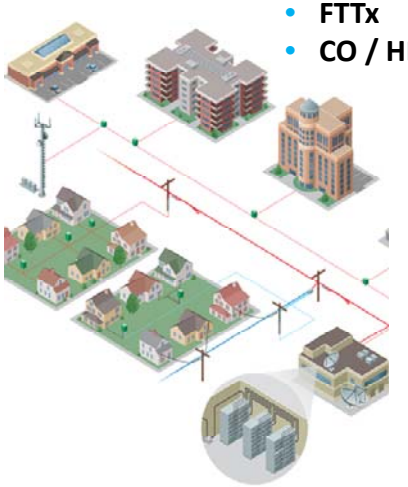
#1 Structured Cabling Solutions



#1 RF (Mobile) Infrastructure

#1 Access network Infrastructure

- HFC
- FTTx
- CO / HE



When do we pursue outside resources for R&D initiatives?

<u>New areas</u> where we have no internal expertise

- Perform initial exploratory work to assess technical viability
- Attain insight on market players and eco-system dynamics
- Formulate sound business plans for how to enter the value chain

<u>New areas</u> where we don't want to commit permanent headcount (yet)

- Obtain basic knowledge/insight to then identify the right talent
- Avoids commitment to non-portable skills

<u>Efforts always focused on creating a competitive advantage</u>

Pros & Cons of R&D Engagements by Partner Type

U.S. National Lab

- \+ Top notch talent
- \+ Realistic & aligned goals
- \+ Thorough contracts
- \+ **Business friendly**
- – Lots of paperwork
- – Fairly expensive
- – Tough to find the right talent
- – Must benefit U.S. economy

U.S. Universities

- \+ Top notch talent
- \+ Easy to find the right talent
- \+ Low-cost support staff
- \+ Access to recruitable talent
- – **Unrealistic approach to IP**
- – Contract experience varies
- – Challenging goal alignment
- – Long negotiation timelines

These are our experiences …. your mileage may vary

A closer Look at the Different Approach to IP Rights

U.S. National Lab

Lead contacts: business friendly

+ Strong desire to help US succeed in global competitive market (aligned priority to have impact)
+ Funding entity can attain control on IP decisions in their field-of-use
+ Royalty stream often shared with inventors (motivated for value)

Easy to close IP win-win

U.S. Universities

Lead contacts: less business friendly

– Difficult to get alignment on goals
  - Publication vs. IP creation
  - IP royalties vs. IP barriers
– University generally insists on controlling IP within all fields
– Royalty stream often owned by University (inventors < motivated)

Very difficult to close on IP

Partner mainly when IP is less likely

Partner with non-US Universities

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Working with DOE Labs

Peter Christensen

Technology Commercialization Manager

Pacific Northwest National Laboratory

May 24, 2016

www.pnnl.gov > Doing Business

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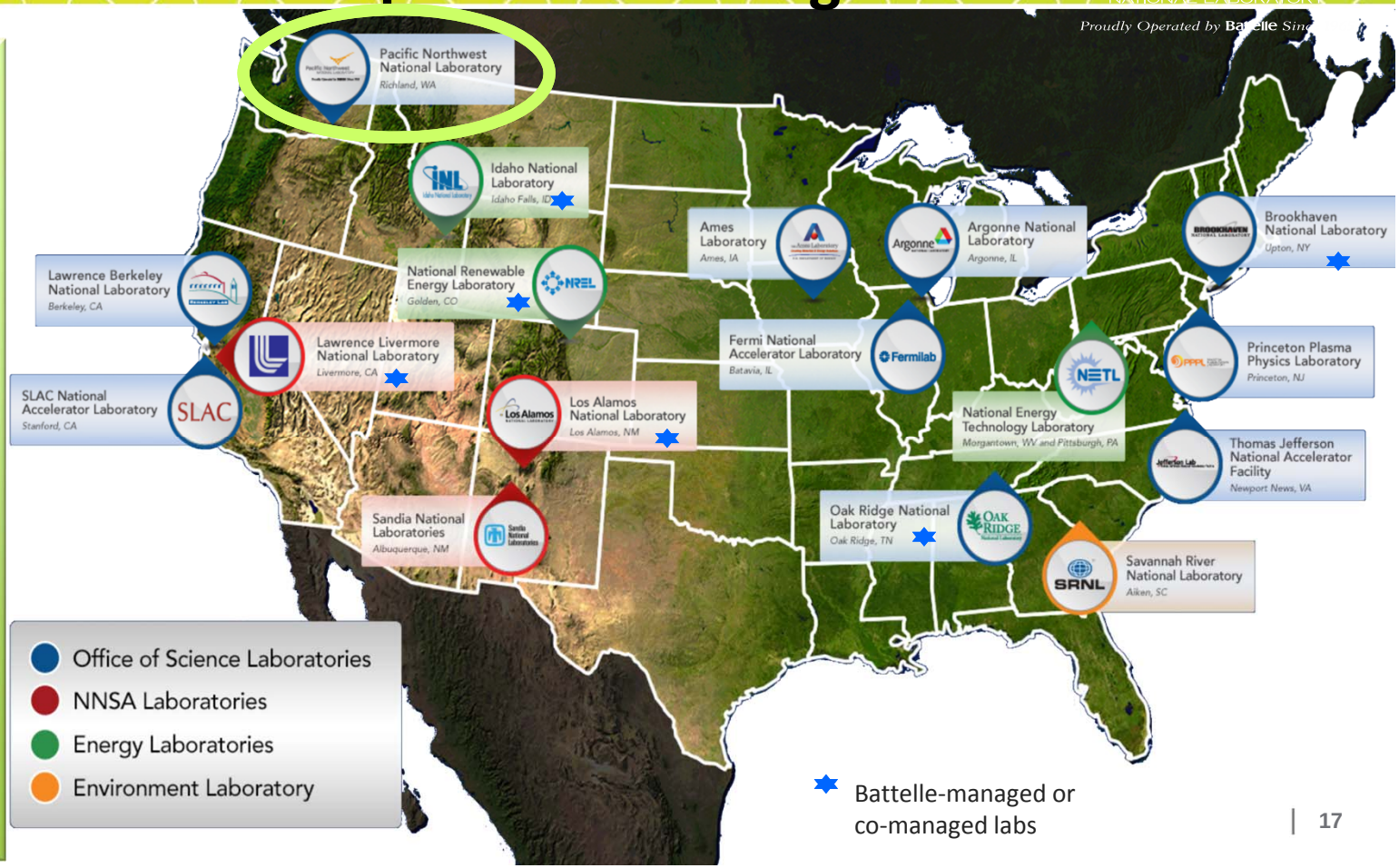
The DOE national laboratory system addresses important challenges

Pacific Northwest NATIONAL LABORATORY

- Crucial capabilities and facilities for DOE's mission, S&T community, and the nation
- Big problems, mission-driven
- Long-term, -term, multi-disciplinary research
- S&T advancements = economic growth, competitiveness



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Breaking down barriers to industry engagement …

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Range of options for working with DOE Labs

Cooperative R&D Agreement

Licensing technology

User Facilities

Partnering for research projects

Strategic Partnership Projects

Small Biz Vouchers and Technology Assistance Program

Agreements for Commercializing Technology

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Light Materials Consortium facilitates industry access to national labs

The Ames Laboratory — Creating Materials & Energy Solutions — U.S. Department of Energy
Lawrence Livermore National Laboratory
Oak Ridge National Laboratory
Argonne National Laboratory
Los Alamos National Laboratory
Pacific Northwest National Laboratory
INL Idaho National Laboratory
NREL National Renewable Energy Laboratory
Sandia National Laboratories

LightMAT — Lightweight Materials CONSORTIUM

Mission:
Create an enduring national lab-based network, enabling industry to use the national labs' unique capabilities related to lightweight materials

Any U.S. company can come to LightMat to find and use resources for lightweight materials R&D

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Collaborating with Federal Laboratories

GRETCHEN BAIER, P.E., Ph.D.

The Dow Chemical Company

May 24, 2016

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The Dow Chemical Company

Founded in 1897

Largest chemical company in the U.S.

Ranked 48th in the S&P Fortune 500

$48 billion in annual revenue in 2015

~ 53,000 employees (6,300 researchers)

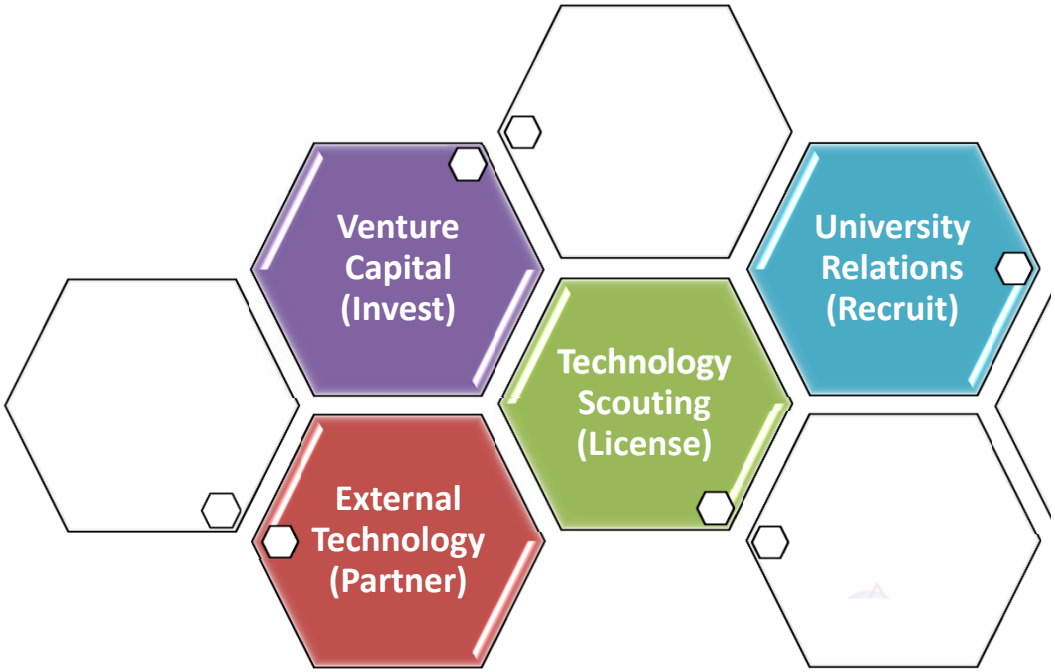
30% of sales are new products

More than 560 US patents granted in 2013

5 R&D 100 Awards in 2014

6,000 product families

201 manufacturing sites in 35 countries



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There are Many Reasons to Collaborate

Sponsored Research (partner with experts)	Use Agreements (access unique tools)	Government Grants (leverage funding)

• Partner with the world's experts to innovate outside the Dow diamond.
  • *Game changing IP terms paved the way for true collaboration.*
  • *University-Industry Demonstration Partnership*
	• Leverage unique facilities to interrogate fundamental science.
	  • *Beamline at Argonne's Advanced Photon Source*
	  • *National User Facilities Organization*
		• De-risk R&D through government contracts.
		  • *Institute for Advanced Composites Manufacturing Innovation*
		  • *Integrated Dual Use Commercial Companies*

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Case Study: Finding the Match with LBNL

High level support from both organizations

Leverage **existing information** to minimize additional work

Two-way exchange

1. One page technical summaries of LBNL projects
2. Technical Road Maps for Dow's capability development

Start with video conferences find the matches*.....* ***with follow-up feedback***

Host WebEx seminars… to get ***broader exposure*** in Dow of the best matches

Visit each other's sites (first at the SME level then leadership*)….to develop* ***specific concepts***

Prepare project proposals (2-page)…..to develop the ***specific ask***

Obtain management approval for projects….***to proceed***

Negotiate contract

BERKELEY LAB

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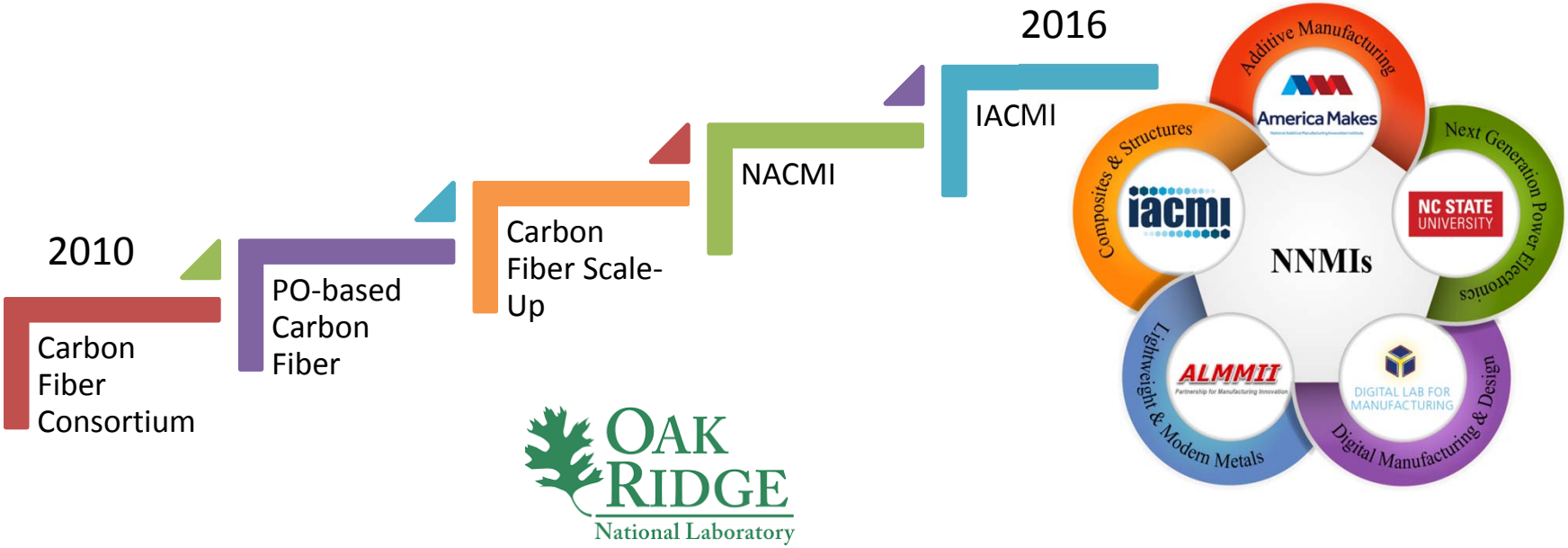
Case Study: Carbon Fiber with Oak Ridge



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NASA Partnering – Putting Space in Your Business

Linda Ham

NASA

May 24, 2016

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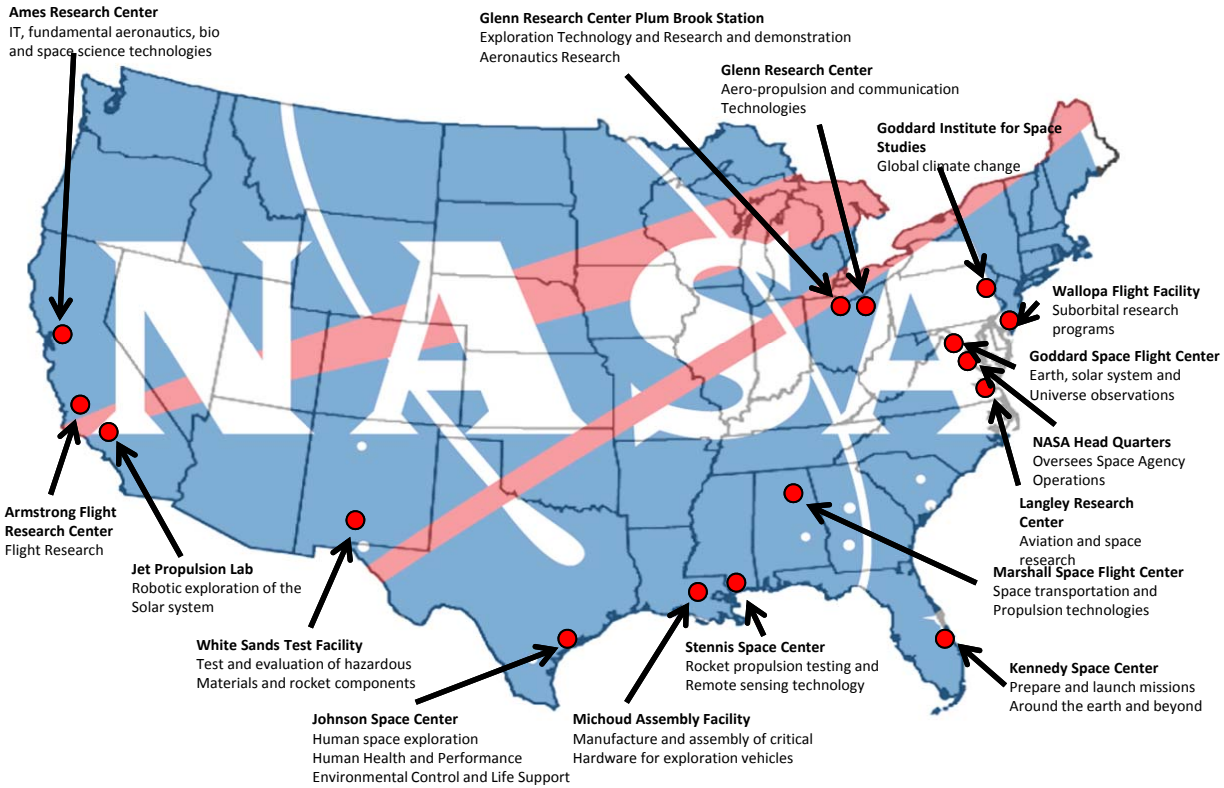

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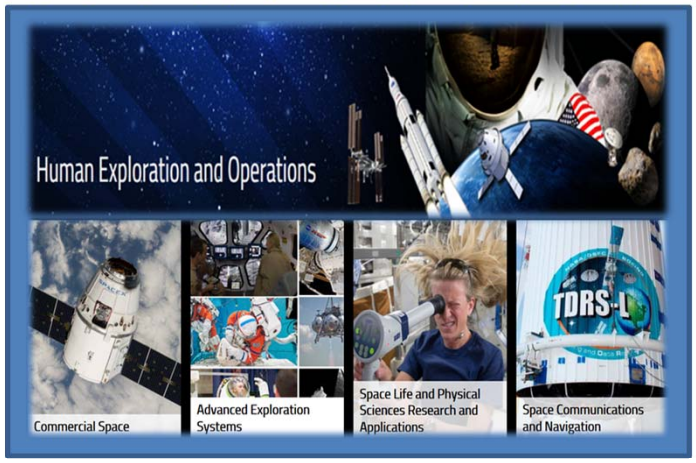
NASA Mission Directorates



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Why NASA Partners?

- Spin out technologies for commercialization
- Spin-in needed technologies to meet mission needs
- Cooperatively develop technologies with Space and Earthbound applications – Discover World's experts
- Advocacy
- Share facilities and skills
- International partners for current and future Spaceflight Programs
- Collaboratively develop US space capabilities

Technology Development

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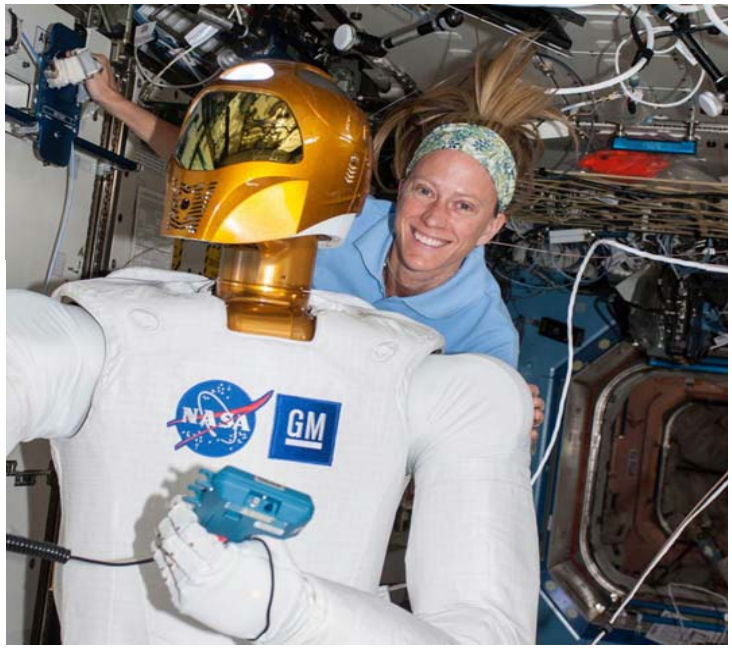
Robonaut Success Story

Reasons for Success

- ✓ Initial focus on the what, not how
- ✓ Focus on solving real problems
- ✓ GM engineers embedded in NASA JSC robotics labs



Success Measures: Furthered knowledge on technology, learned how to solve certain set of problems, found out what we don't know, 43 patents and patent pending

Opportunities: Find commercialization partner

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Mechanisms for Partnering ?

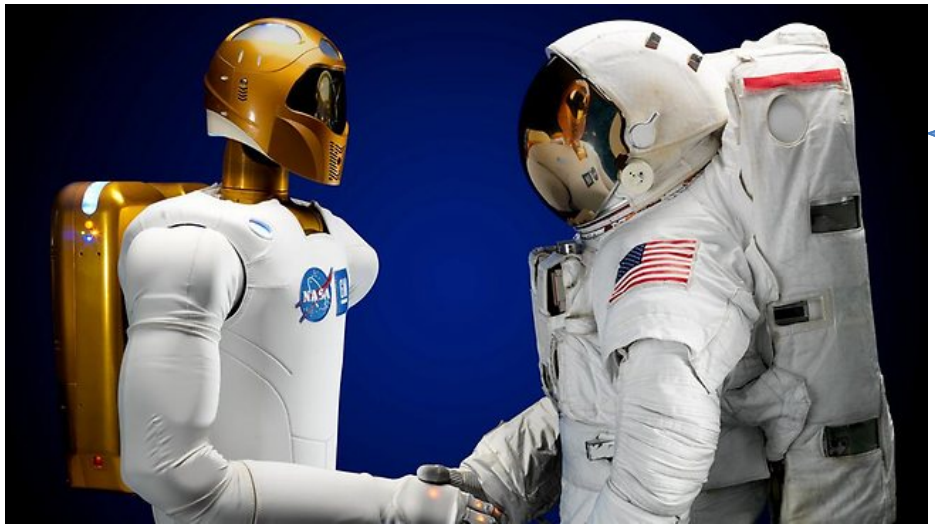
Space Act Agreement

Licensing Technology

International Agreements

Cooperative R&D Agreement

Interagency Agreements



Software Use Agreements

Communities of Practice

Non-binding Agreements

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GameChanger

James Unterreiner

Shell

May 24th

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Shell

GameChanger

"Turning Ideas into Reality"

Deliver a steady stream of energy related innovations that have the potential to drastically impact the future of Shell

- A small Global team
- We "invest" in entrepreneurs with revolutionary ideas

Keys to Success

- Spectrum of partnerships. One solution will not fit all needs
- Partnerships materialize different ways. Focus on solving real challenges
- Talk about problems and challenges
- Identify areas for collaboration
- Non-confidential basis as long as possible. Talk about the what not the how.

Opportunities

- Catalogs of technologies. Open innovation.
- Define a clear path to success (commercialization)
- Understand the economics
- Identify and engage partners early

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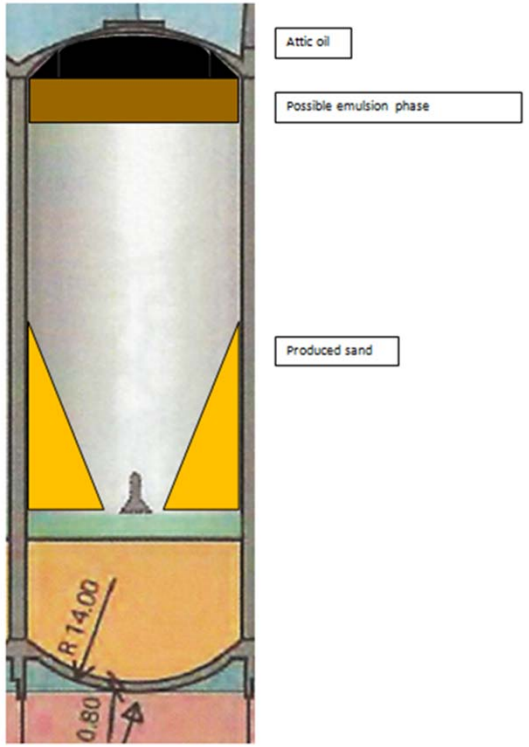
Decommissioning Inspection



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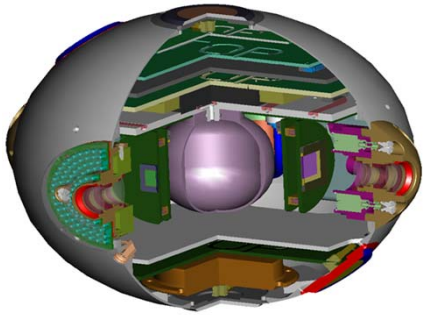
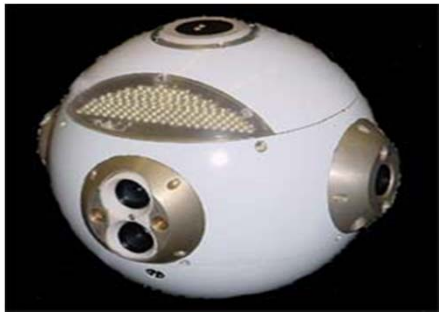
Related work - Aercam





NASA-Shell Brent Cell

Why is it a game changer? The NASA-Shell Brent Cell rover eliminated the costs associated with sending our people and ships to the platform, and having to concrete core each cell. It also eliminated the risks associated with having to send in divers into the cells to collect samples.

10/10/2012
Initial discussion of opportunity at Hunters meeting.

24/10/2012
Hunters unconstrained workshop session on cell access.

10/11/2012
Preliminary discussions between NASA and Gamechanger.

24/10/2012
1st framing session with NASA and Brent Decom

29/11/2012
Screening panel – Gamechanger funds approval to NASA.

04/12/2012
Technical consultation with Brent team on requirements.

18/12/2012
Initial high level concepts and designs distributed to Brent team.

10/01/2013
NASA build testing facility for initial concepts in JSC research tank.

07/02/2013
Delivery of final design concept to Brent Decom team.

10/03/2013
Concept select and DG3 presentation to Brent LT.

20/06/2013
FEED completion. Full scale operations commence to build and deliver ROV.

10/12/2013
Delivery of product to platform for deployment.

Q1/2014
Execution, deployment of ROV to site and acquisition of data from storage cells.

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U.S. Army Research Laboratory Engagements with Industry

Thomas Mulkern

ARL

24 MAY 2016

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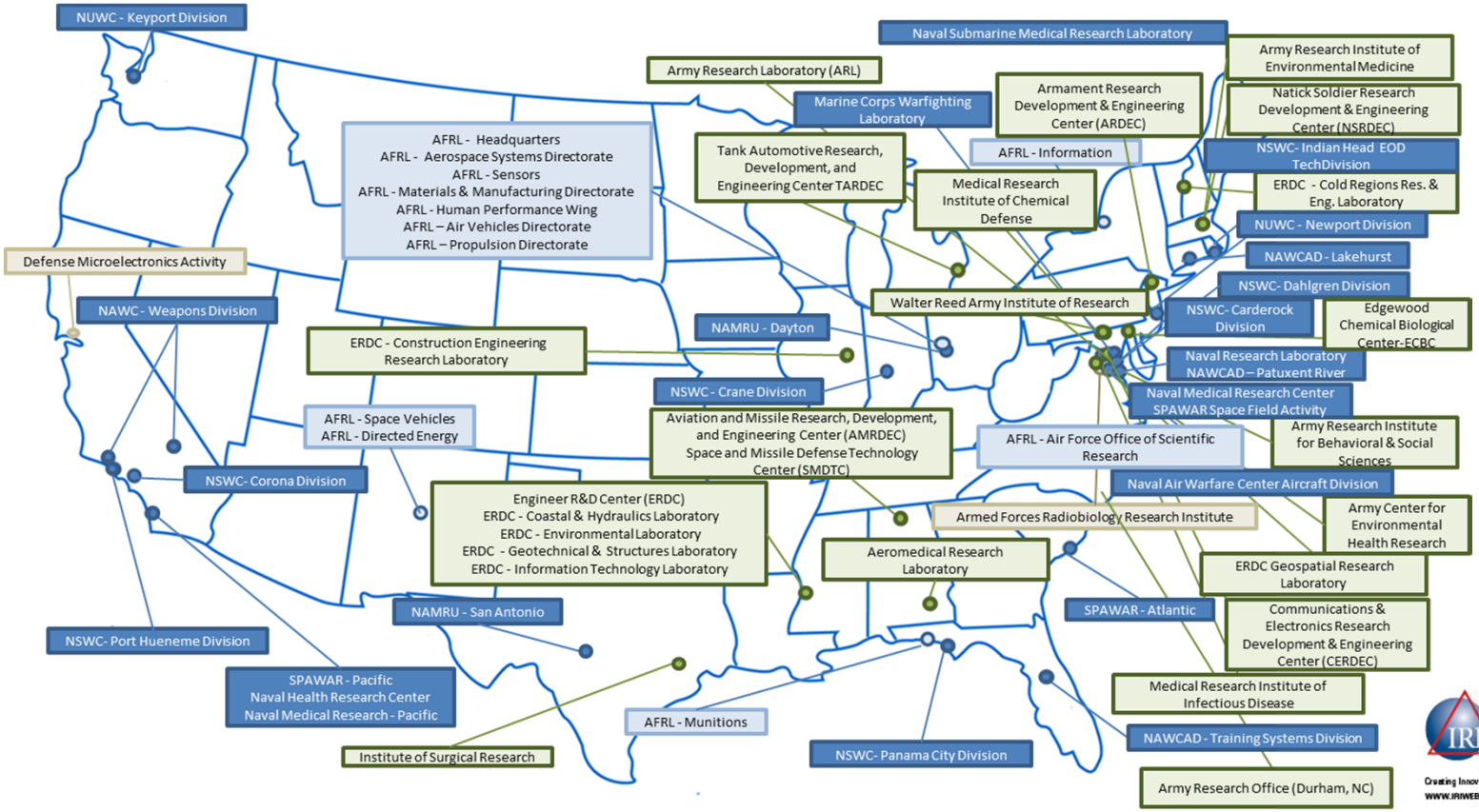
DoD Labs



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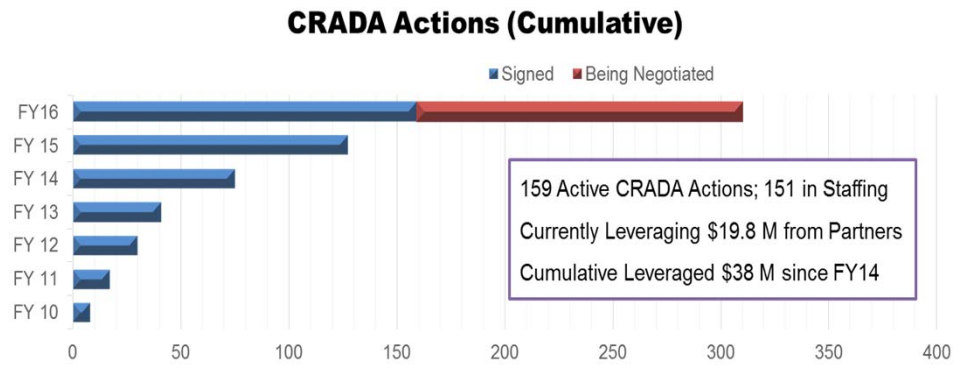
ARL Open Campus



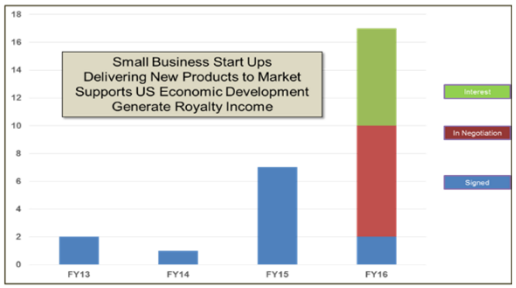
Partnership Intermediaries

TechLink

MBA Programs

I-CORPS

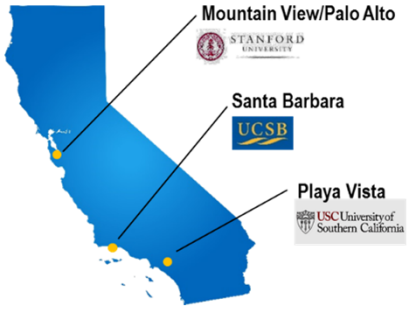
VirginiaTech · The George Washington University · Johns Hopkins University



ARL

ARL West

- Local Army Laboratory for west coast university interactions & recruitment
- Leverage ongoing research at California Universities and regional start up companies
- ARL-distinct facilities made available in the Playa Vista areas
- Excellent potential for increased innovation through closer collaboration



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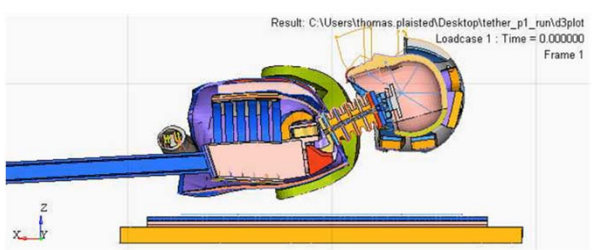
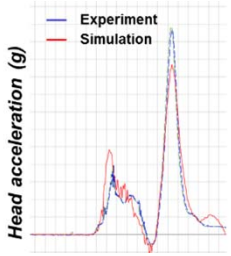
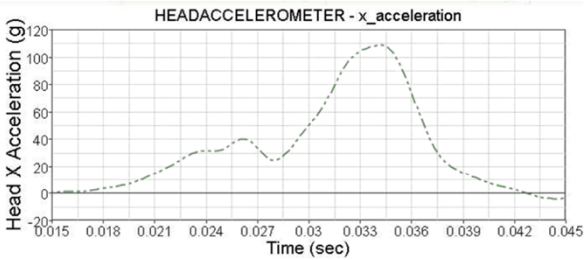
Success Story

Rate-Activated Tether for Reduction in Ground Impact-Induced TBI

- Collaboration with NFL/Under Armor/GE/ARL
- Concept: Use tether to reduce head velocity during backward falls, and severity of head-to-ground impact
- Rate-activated tether provides over 100X more force during high speed extension, compared to low speed extension







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Success Story

Purpose:

- Produce high energy density safe Li-ion batteries
- Develop the manufacturing process for the 5 V materials
- Prototyping Li-ion batteries that are tolerant to abuse and of higher energy density than currently available.

Payoff:

- Improved performance across all platforms
- Safer operation of Li-ion batteries under abuse conditions

Hydro Québec

ARL

U.S. ARMY MANTECH Manufacturing Technology

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