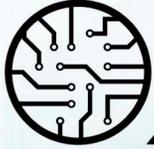


DoD

EXECUTIVE AGENT



PRINTED CIRCUIT BOARD AND INTERCONNECT TECHNOLOGY



**GOING
OUT
OF
BUSINESS**

Equipping the U.S. Warfighter with Unrivaled Electronic Interconnect Technologies

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Product Acquisition Risks in the Printed Circuit Board Industry

Presented by:

Craig Herndon, Program Manager

DoD Executive Agent for Printed Circuit Board and Interconnect Technology

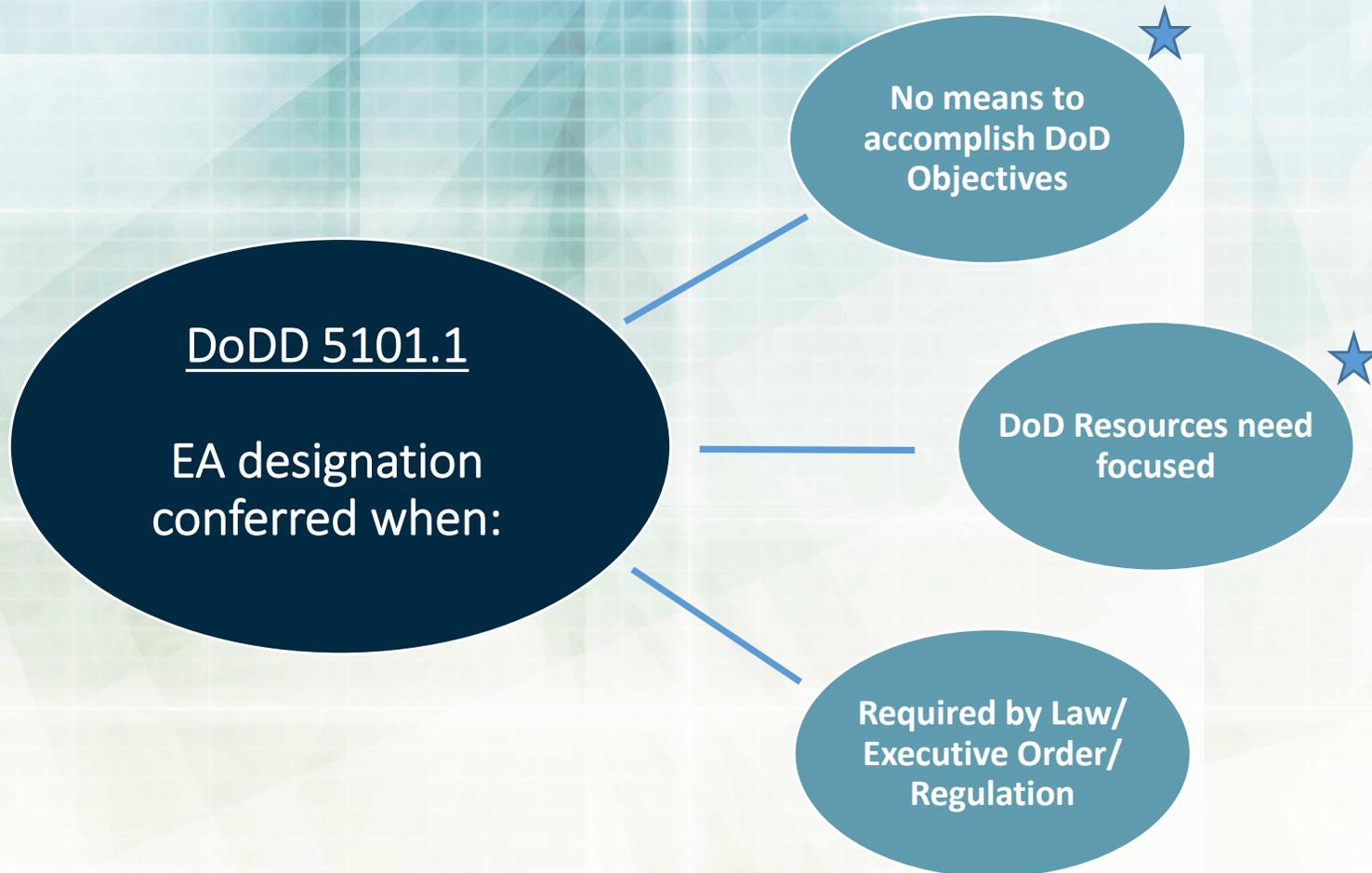
Naval Surface Warfare Center, Crane Division

24 October 2018

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What is a DoD Executive Agent?

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Responsibilities of the PrCB EA

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Mission

“Ensuring DoD access to trusted and affordable electronic interconnect technology necessary for critical national defense system and warfighter superiority”

EA Charter Mission Focus Areas

Trust Assurance

Technology Development

Supply Chain Risk Management

Knowledge & Capability Sustainment

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From the original DEPSECDEF Itr & DoDD 5101.18E tasking...

- ✓ “Development & maintenance of a printed circuit board and interconnect technologies roadmap...”
- ✓ “Assessment of the vulnerabilities, trustworthiness, and diversity of the printed circuit board supply chain...”

- **What are the challenges?**
- **What can we do?**

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The good old days!

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Understanding the challenges

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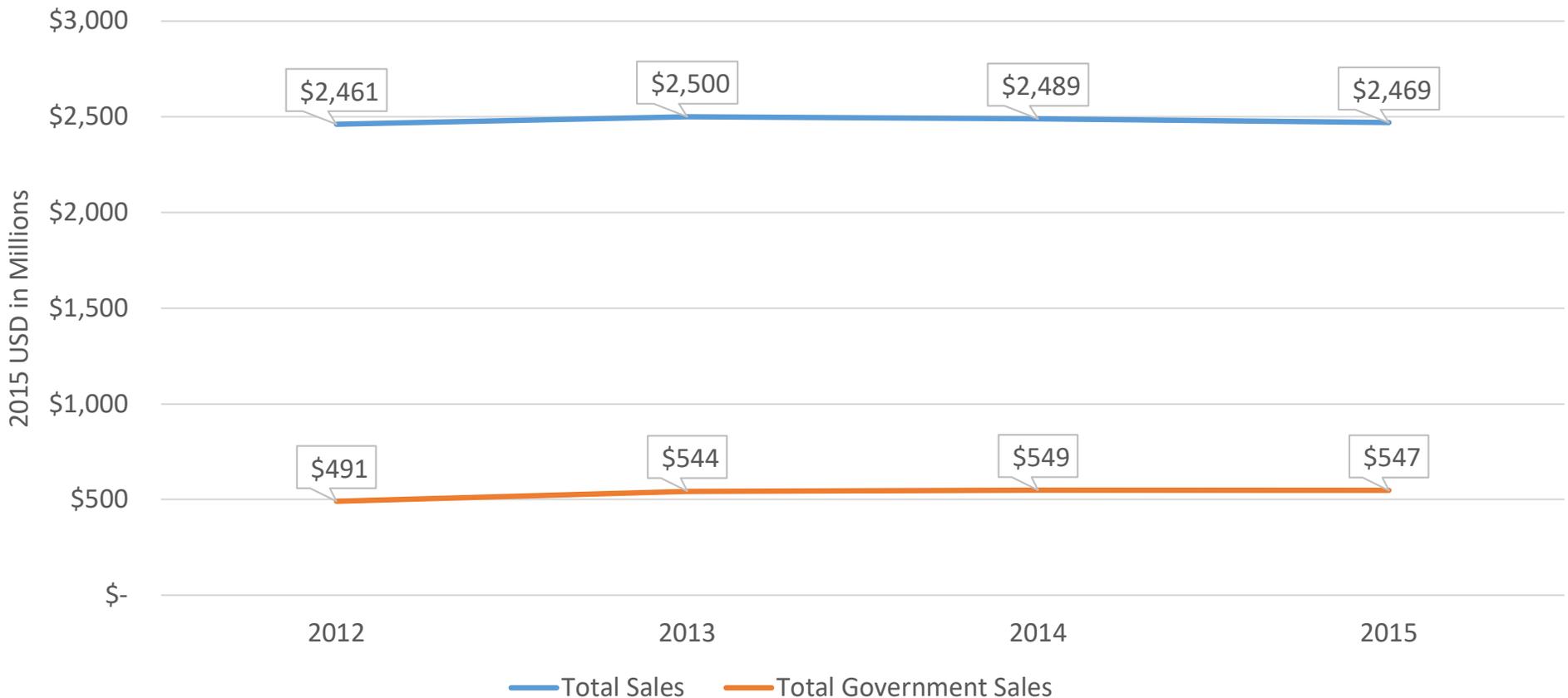
- PrCB EA/DoC Bureau of Industry and Security (BIS) survey on U.S. bare PrCB manufacturers
 - Identifying critical suppliers and capabilities
 - Documenting issues affecting the industry
 - Assessing the long-term health of the industry
- Responses from 185 companies operating 202 bare PrCB manufacturing facilities

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U.S. PrCB Facility Sales

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U.S. Bare PrCB Manufacturing Facility Sales: 2012-2015 (in 2015 USD)

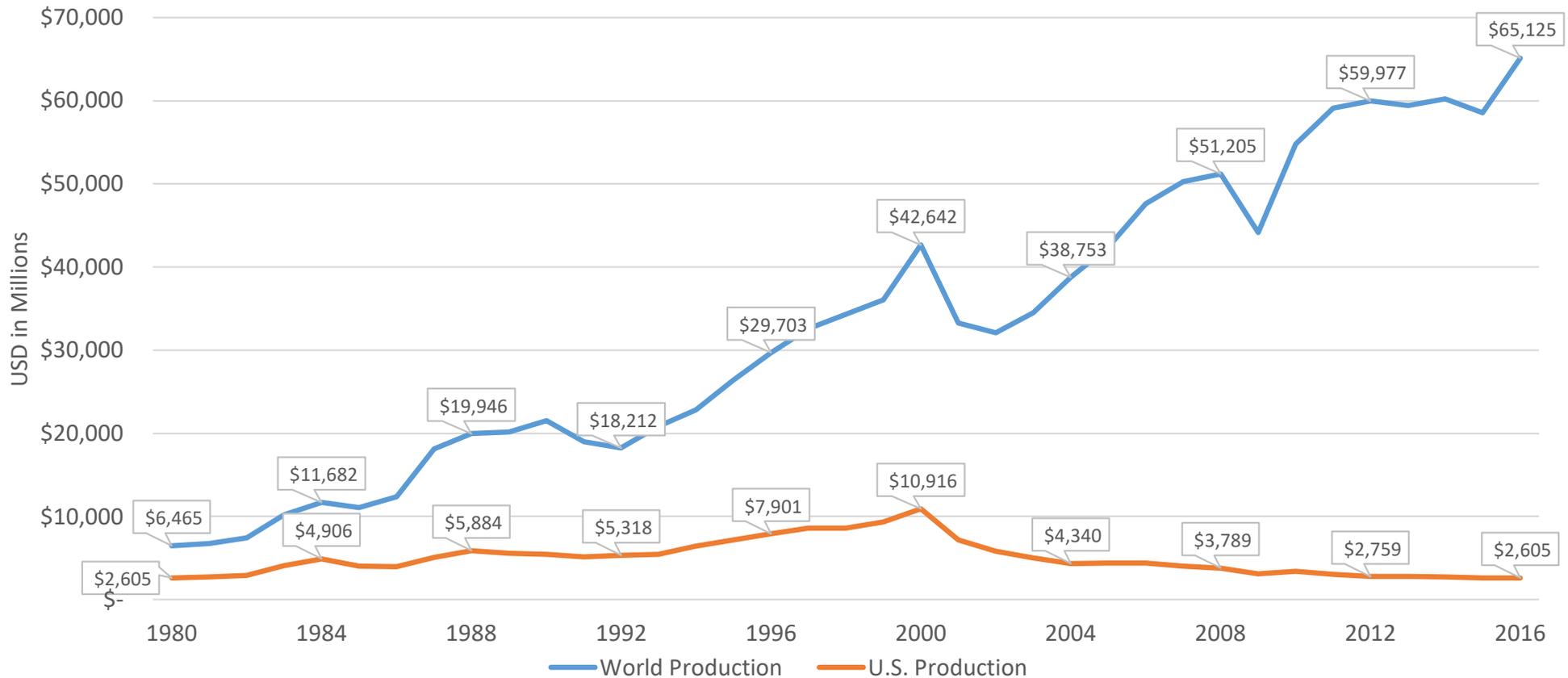


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World vs. U.S. PrCB Sales

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World Production vs. U.S. Production of PrCBs

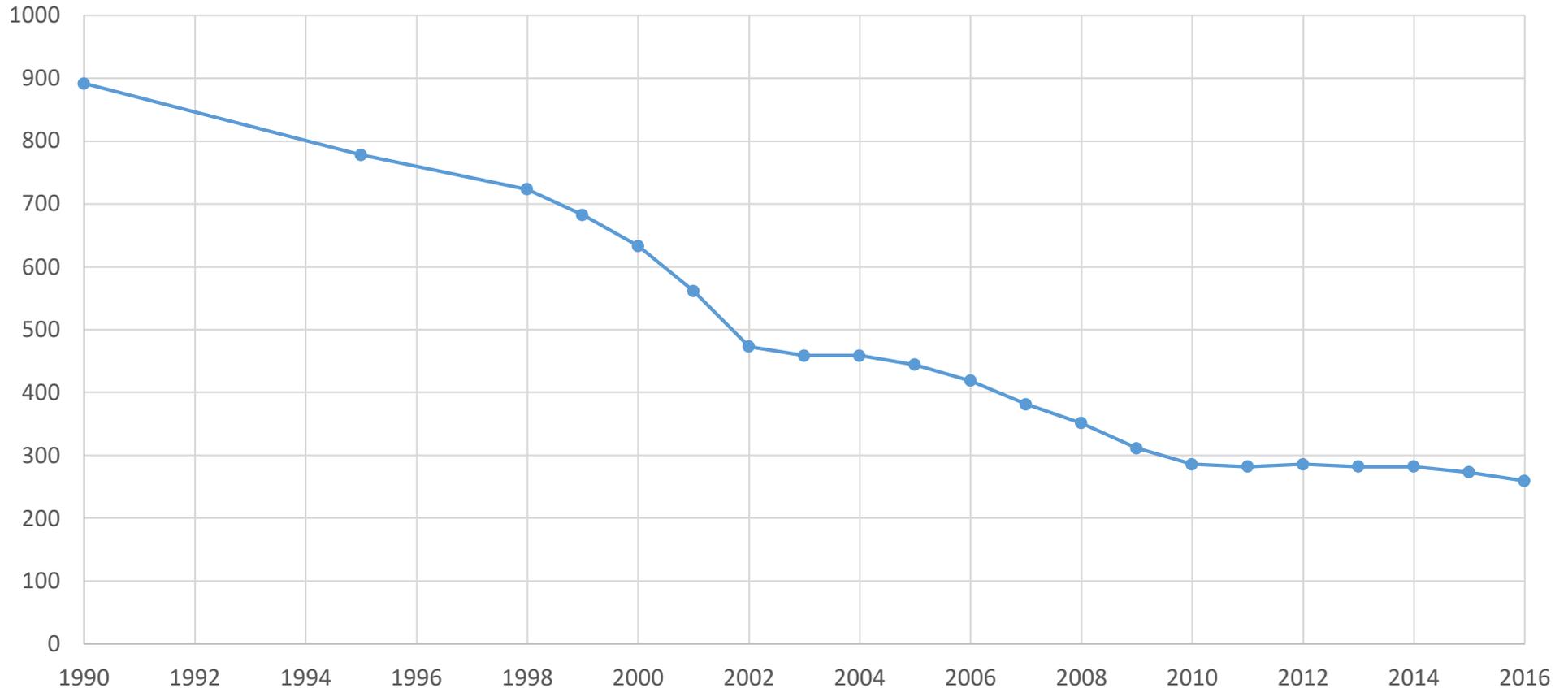


Sources: IPC World PCB Report 2014, IPC World PCB Report 2015, and IPC World PCB Report 2016

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Estimated Number of PrCB Facilities in the United States: 1990-2016

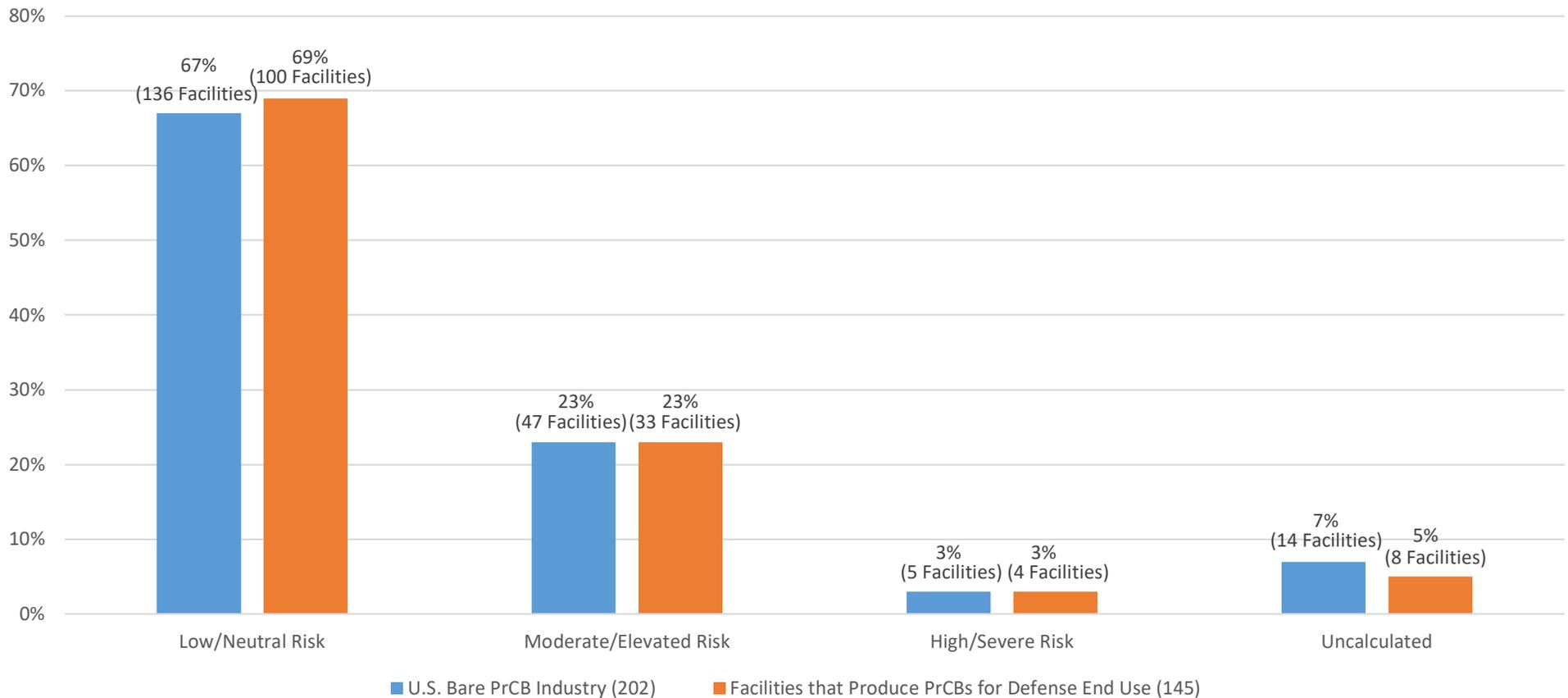


Source: Personal Correspondence with Sharon Starr, IPC, 9 November 2017.

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Financial Risk Rating for Industry vs. Defense End Use



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DoD PrCB Purchasing Trends

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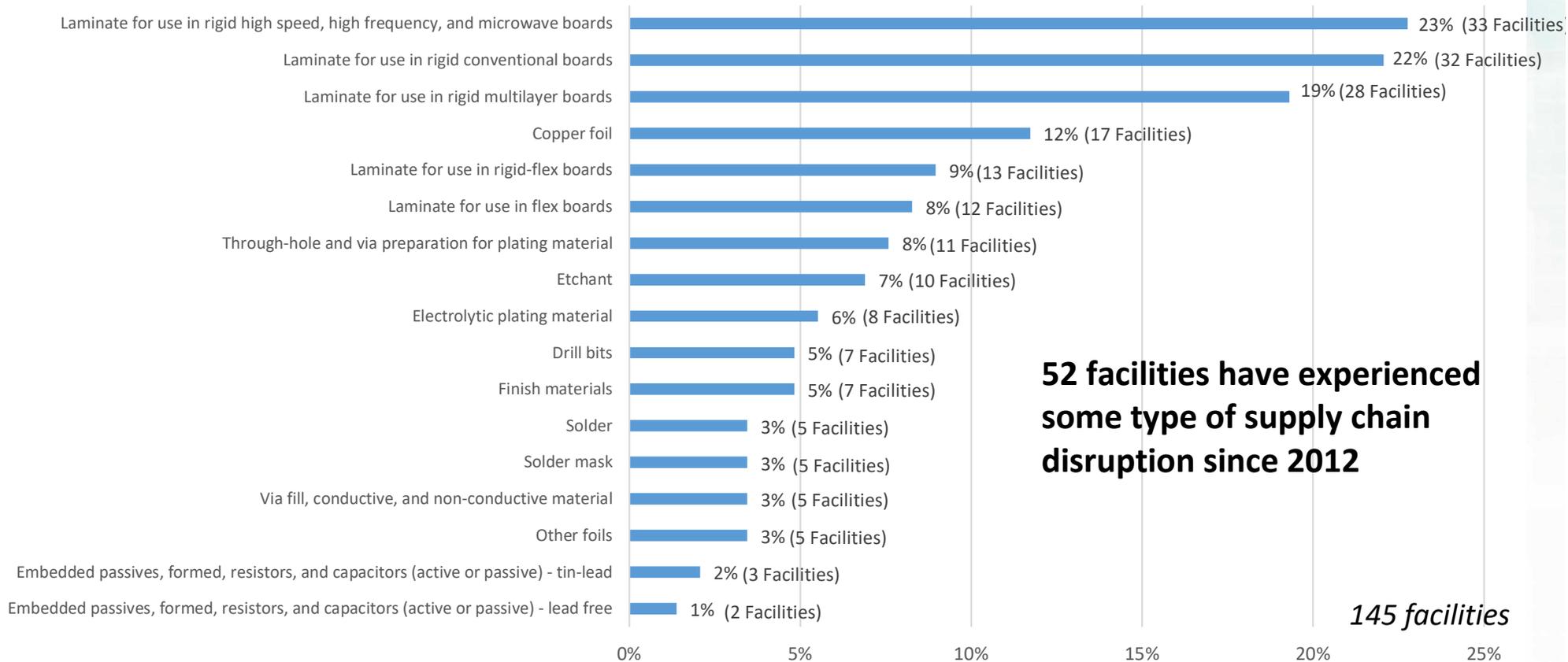
- In 2015, an estimated 73 percent of total sales of bare PrCBs produced for defense end use were purchased from 14 companies and 24 facilities; and 2 of those facilities have reported negative profit margins every year since 2012
- 49 PrCB facilities simultaneously support at least 10 different U.S. government programs
- Of the 49 facilities that support numerous U.S. government programs, 13 are classified as moderate/elevated financial risk and 2 are classified as high/severe financial risk; and 3 have indicated possible closure in 2016-2020

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Supply Chain Disruptions

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% of Facilities that produce PrCBs for Defense End Use that have Experienced Supply Chain Disruptions since 2012

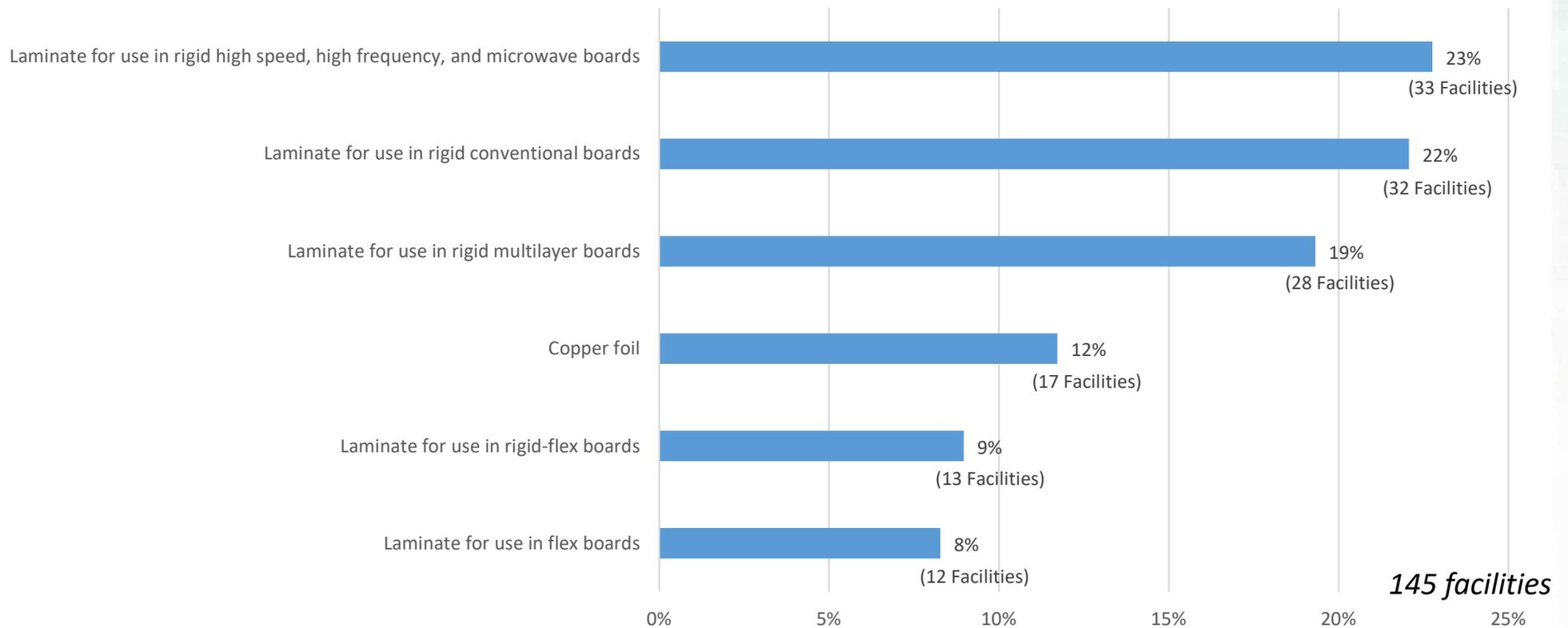


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Supply Chain Disruptions

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% of Facilities that produce PrCBs for Defense End Use
 that have Experienced Supply Chain Disruptions since 2012
 (with emphasis on most critical issues)

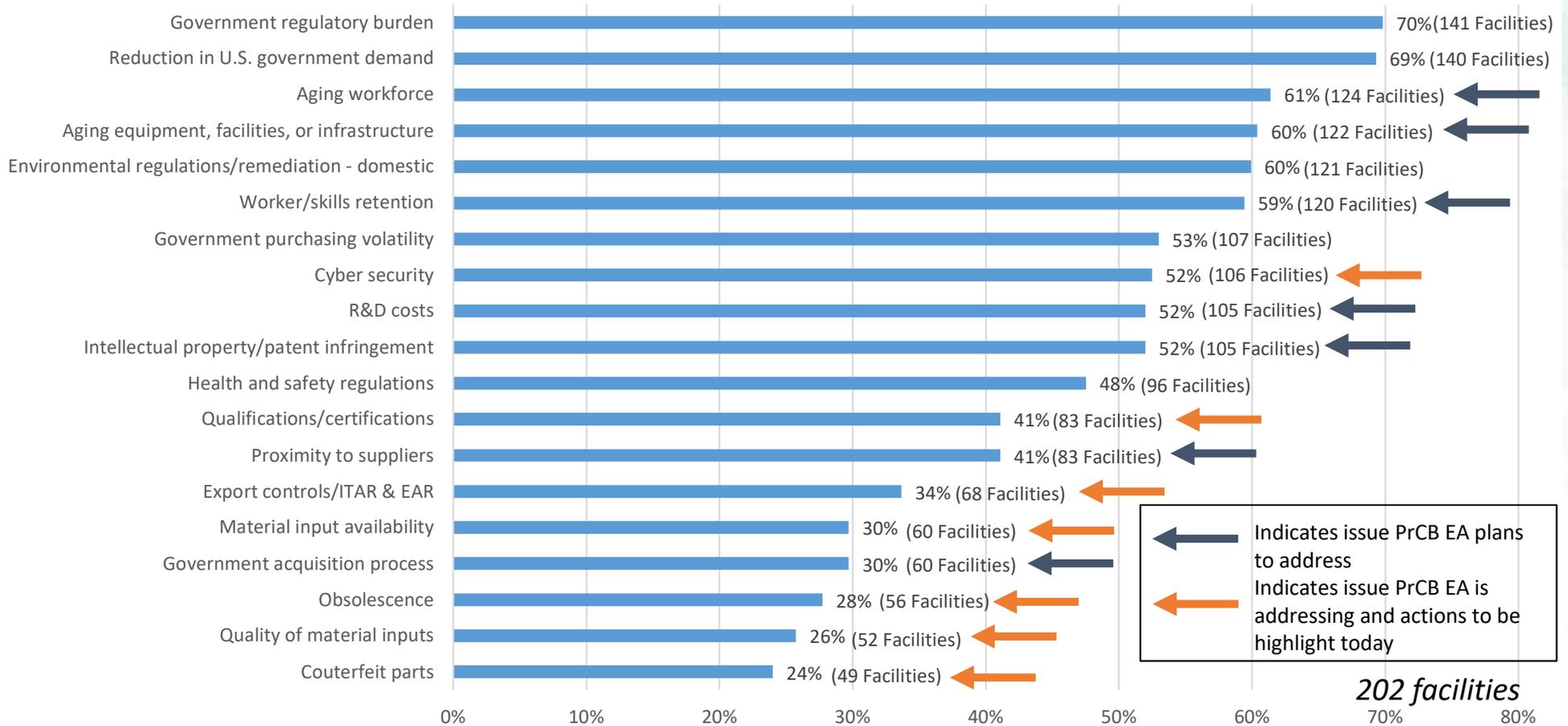


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Challenges Affecting Industry

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Facilities that Identified Topic as Challenge Facing Industry

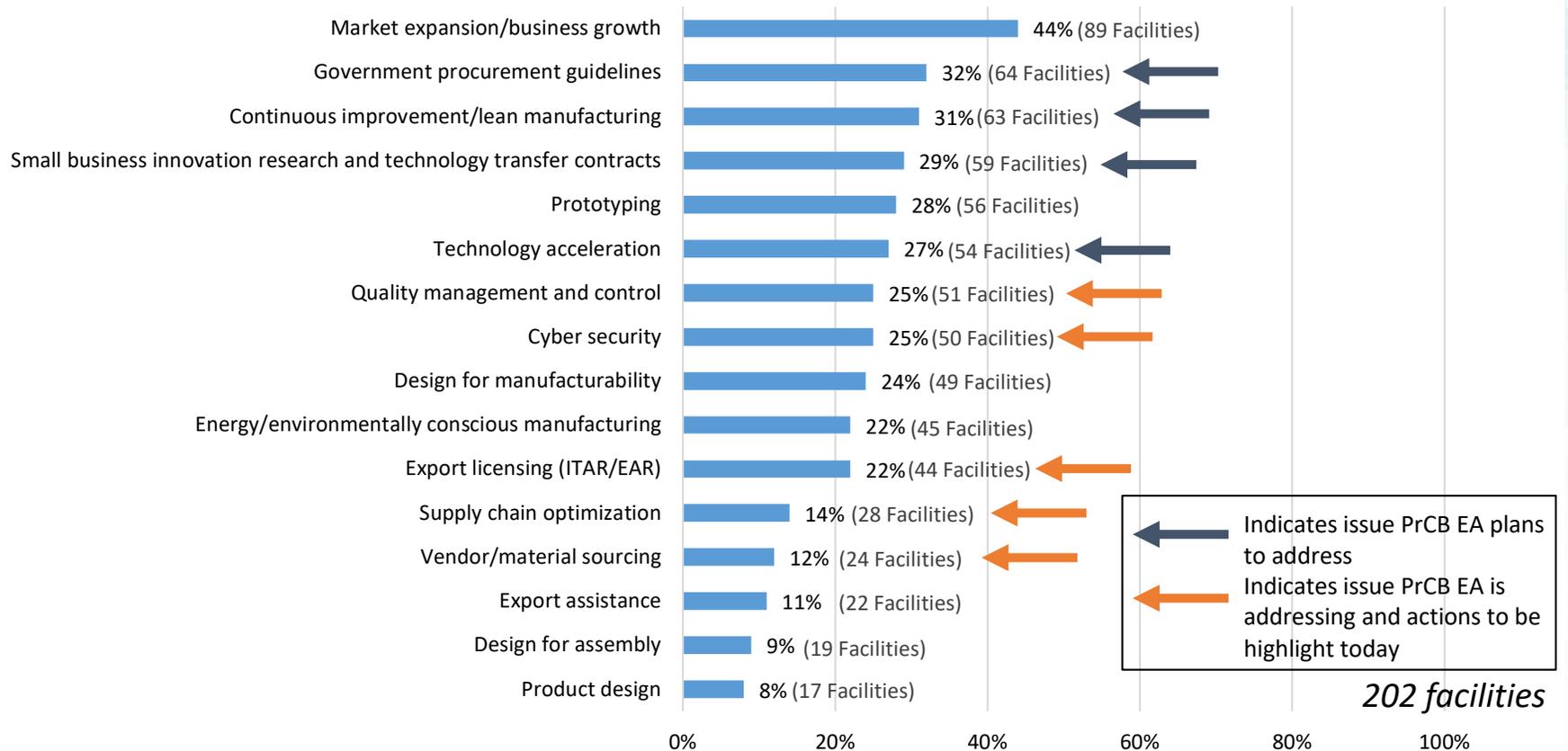


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Areas of Interest for Outreach

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Facilities that Identified Topic as Area of Interest for U.S. Government Outreach



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What are we doing?

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- Trusted certification program (IPC-1791 standard)
- Development of Supply Chain Risk Management tools
- Training workshops
- Collaborative solutions w/ industry
- Stakeholder engagement efforts to identify other emerging issues

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- Evaluated more than 20 different private supply chain management systems
- Interviewed DoD suppliers
- Participated in in-depth demonstrations
- Developing a pilot program
- Final Product to support the PrCB EA in assessing and responding to risks within the PrCB supply chain

Supply Chain Risk Management System Development

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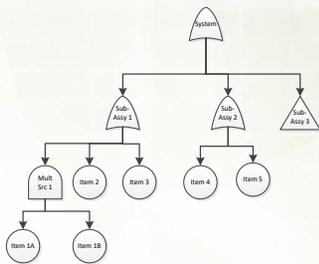
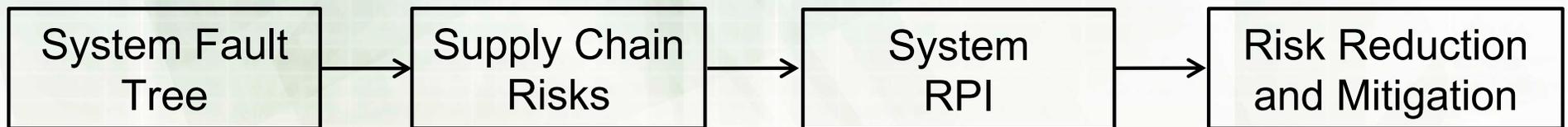
- Supply Chain Risk Management System Development
 - **Project 1:** Stakeholder Engagement and Analysis
 - **Project 2:** Evaluation of Supply Chain Mapping and Management Systems
 - **Project 3:** Implementation of Supply Chain Mapping and Management System
 - **Project 4:** Assessment of the DoD PrCB Supply Chain

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Supply Chain Risk Analysis Model (SCRAM)

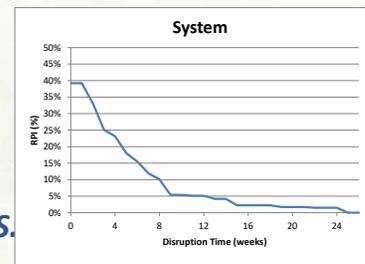
- Dynamic Fault Tree Model
- Models a plurality of Supply Chain Risks (Holistic View)
- SCRAM Risk Probability Index (RPI)
 - Likelihood of Occurrence
 - Recovery Time
- Perform unique analysis (e.g. Cut-Sets) to identify high-risks and develop risk mitigation approaches



Supply Chain Risk #1
 Supply Chain Risk #2
 Supply Chain Risk #3

...

Supply Chain Risk #k



Cutset Rank	Cutset Members	Cutset Contribution
1	Item 2	0.349
2	Sub-Assy #3	0.201
3	Item 3	0.178
4	Item 5	0.153
5	Item 4	0.144
6	1A, 1B	0.090

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- Executive Order 13806 – “Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States”
- The MITRE Report – “Deliver Uncompromised” – A Strategy for Supply Chain Security and Resilience in Response to the Changing Character of War

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BACKUP SLIDES

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- 5 Macro Forces Driving DoD Supply Chain Risk:
 - **Uncertainty in U.S. Government Spending**
 - ➔ **DOC Survey: Reduction in U.S. Government Demand = #2 Challenge Facing PrCB Industry; Government Purchasing Volatility = #7 Challenge Facing PrCB Industry**
 - **Decline in U.S. Manufacturing Base Capability**
 - ➔ **DOC Survey: Aging Equipment, Facilities, or Infrastructure = # 4 Challenge Facing PrCB Industry**

- 5 Macro Forces Driving DoD Supply Chain Risk:
 - **U.S. Government Business Practices**
 - ➔ **DOC Survey: Government Regulatory Burden = #1 Challenge Facing PrCB Industry**
 - **Industrial Policies of Other Countries**
 - ➔ **DOC Survey: Intellectual property/patent infringement = #10 Challenge Facing PrCB Industry**
 - **Decline in U.S. Worker Skills**
 - ➔ **DOC Survey: Aging Workforce - #3 Challenge Facing PrCB Industry; Worker/Skills Retention - #6 Challenge Facing PrCB Industry**