National Economic Impacts of the DoD SBIR/STTR Program
1995 - 2018

And Additional Outcome Metrics

NASEM Workshop on *Data and Metrics for the DoD SBIR and STTR Programs*

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About TechLink

- Est. 1996 at Montana State Univ. for regional (5 State) NASA Technology Transfer (T2)
- In 1999, became 1st, and primary, National Partnership Intermediary for DoD T2 (per 15 USC 3715)
- Primary Activity: DoD Patent License Agreements (PLAs)
  - Facilitate ~80% all DoD PLAs, also CRADAs, other T2 activities*
- SBIR outreach & support for DoD since 2000*
  - Regionally, then nationally: focus on Transition/Commercialization
  - Also in-state support for all agencies
- Economic Impact Studies (EIS) now a Key Activity
  - Over 20 EIS conducted for SBIR, T2 for DoD, DOE, NCI

** All support is provided at no cost to client companies*

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TechLink Economic Impact Studies (EIS)

- Goal is typically ~95% response rates, achieved by:
  - Skilled, motivated team of trained professionals
  - Agency support with Letter of Authorization, responses as needed
  - Companies generally supportive – SBIR EIS used for Reauthorization
  - Financial data only reported in aggregate – no individual results to government agencies (except for voluntary Success Stories)
  - Consideration for companies' time, minimizing intrusion
  - In-depth background research includes data validation, current contacts, prior contacts, etc.
  - Best Practices approaches include e-mail, phone, social media
  - Team effort, esp. trading records for different approaches
  - Strong IT support with secure, versatile database

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2018 DoD SBIR/STTR EIS*

- Followed two prior DoD SBIR/STTR EIS:
  - 2014 USAF SBIR/STTR Economic Impact Study*
    - 4,524 Phase II awards to 1,750 companies, contracts ending FY2000-2013
    - Award value $4B, 96% response rate, $47.9B total U.S. economic impact
  - 2015 U.S. Navy SBIR/STTR Economic Impact Study*
    - 2,734 Phase II awards to 1,199 companies, contracts ending FY2000-2013
    - Award value $2.3B, 95% response rate, $44.3B total U.S. economic impact
- Looked at all DoD Phase II awards initiated FY1995-2012
  - Start dates provided better timeline consistency
  - Total 16,959 Phase II contracts awarded to 4,412 companies**
  - Award value $14.4B, 96% response rate (97% total completion)
  - IMPLAN analysis by Leeds School of Business at UC Boulder

** Available at https://www.sbir.gov/impact*
*** Numbers vary due mergers & acquisitions*

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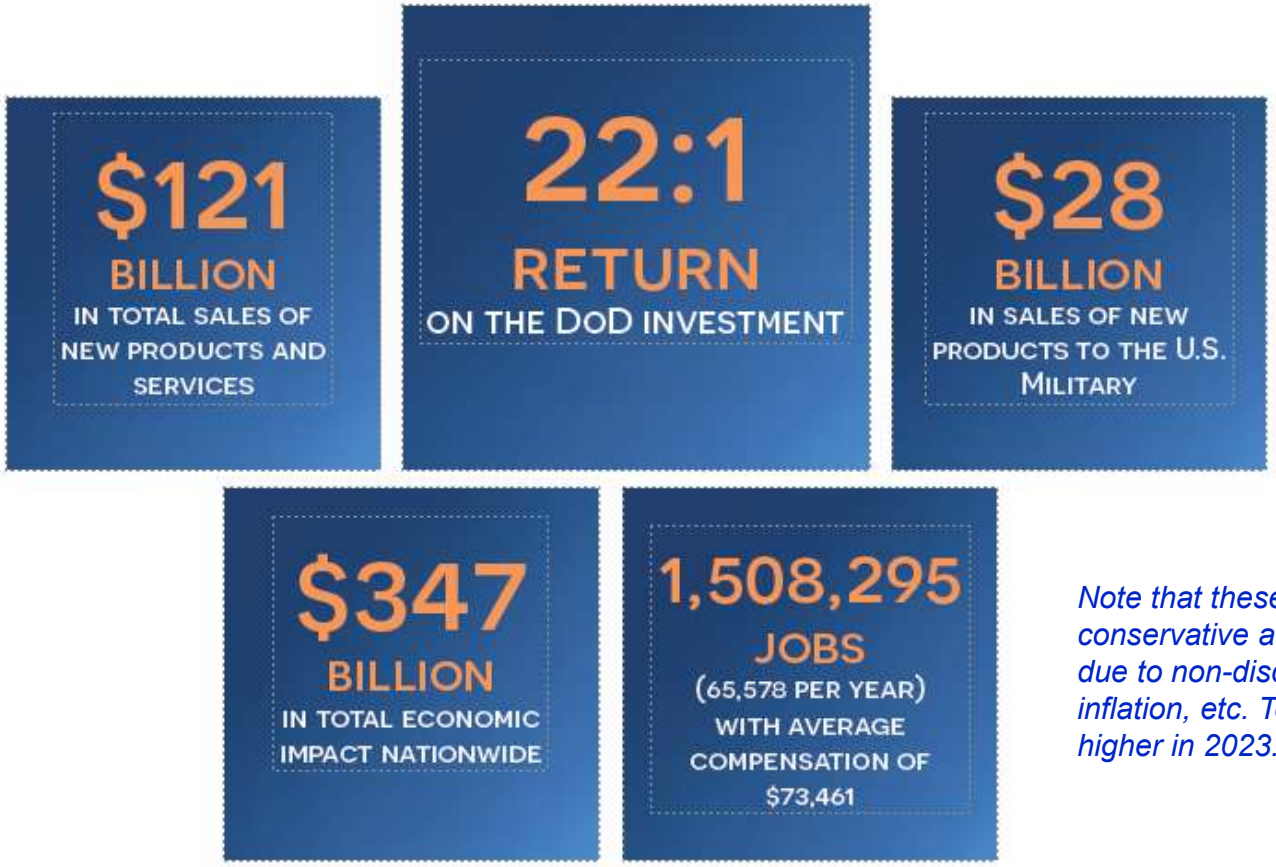
2018 DoD SBIR/STTR EIS Results Summary



Note that these numbers were very conservative at the time of the study (2018), due to non-disclosures, classified contracts, inflation, etc. Total values would be much higher in 2023.

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Other Economic Impacts

- Outside investments in company $9.5 B
  - ✓666 companies received VC/Angel funding
- Acquisitions of SBIR/STTR companies 496
  - ✓ Based primarily on DoD SBIR/STTR innovations
- Value of acquisitions $35.6 B
  - ✓ Understates value: Majority couldn't disclose

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IMPLAN Outputs*

- Economic impacts derived from IMPLAN modeling:
  - ✓ Total economic output
  - ✓ Employment
  - ✓ Labor income (including average income per job created)
  - ✓ Tax revenues (federal and state)

** Conducted by Business Research Division, Leeds School of Business, University of Colorado Boulder*

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Key IMPLAN Terms

- Direct Impact

  Initial economic activity (e.g., sales of resulting products, follow-on R&D services, and initial SBIR R&D expenditures)

- Indirect Impact

  Inter-industry purchases of machinery, components, and supplies needed to manufacture products

- Induced Impact

  Payroll spending by workers, spending their earnings on goods and services in the economy

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Total Economic Impacts

Total Economic Impacts from DoD SBIR/STTR Program, FY 1995-2018

Impact Type	Employment (Job Years)	Employment (Av. Per Year)	Labor Income ($ Billions)	Labor Income (Per Job)	Output ($ Billions)	Tax Revenues ($ Billions)
Direct	360,508	15,674	$43.03	$119,357	$137.01	$13.48
Indirect	453,365	19,712	$32.15	$70,904	$96.96	$11.22
Induced	694,422	30,192	$35.63	$51,302	$113.31	$14.72
TOTAL	1,508,295	65,578	$110.80	$73,461	$347.28	$39.42

Source: IMPLAN National Model

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Analyses of Outcomes

- Revenue by type and by year of award
- Return on Investment (ROI) by award year (Total Economic Impact divided by total SBIR award value)
- Comparing results for Army, Air Force and Navy
- Results for SBIR vs. STTR
- Example of SBIR First-timer Success
- Summary of Key Findings

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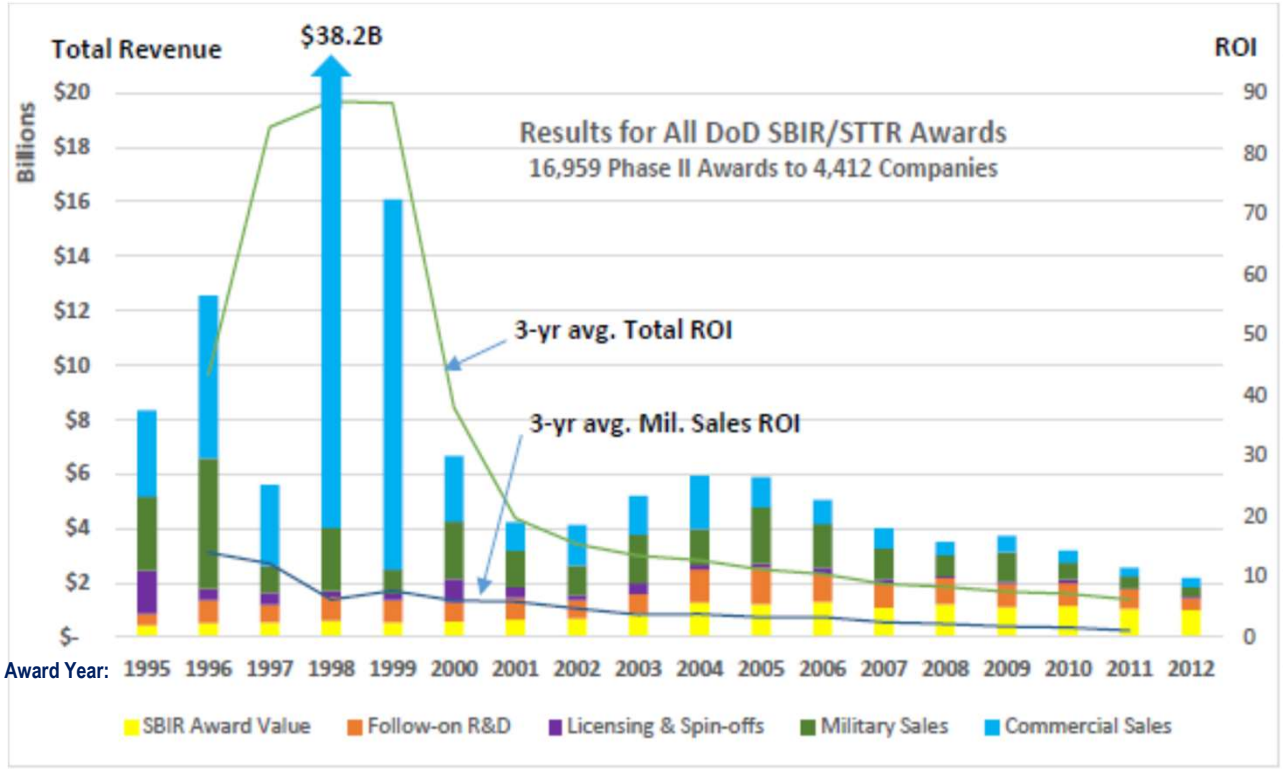
Overall Results by Year of Award



# Awards:	626	708	685	736	646	666	697	729	935	1346	1200	1334	1019	1205	1138	1200	1100	989

- Total ROI = (total economic impact)/(award value)
- Average total ROI is <u>much</u> larger for pre-2000 awards
- ROIs averaged over 3 years (+/- one year) to reduce excursions from "outliers"
- Most large "outliers" were pre-2000 awards
- Number and total value of SBIR/STTR awards grows rapidly after 2002
  - Increases total revenue, not ROI
- Military sales initially grow faster than commercial sales
- Long-term military sales growth eventually surpassed by commercial sales

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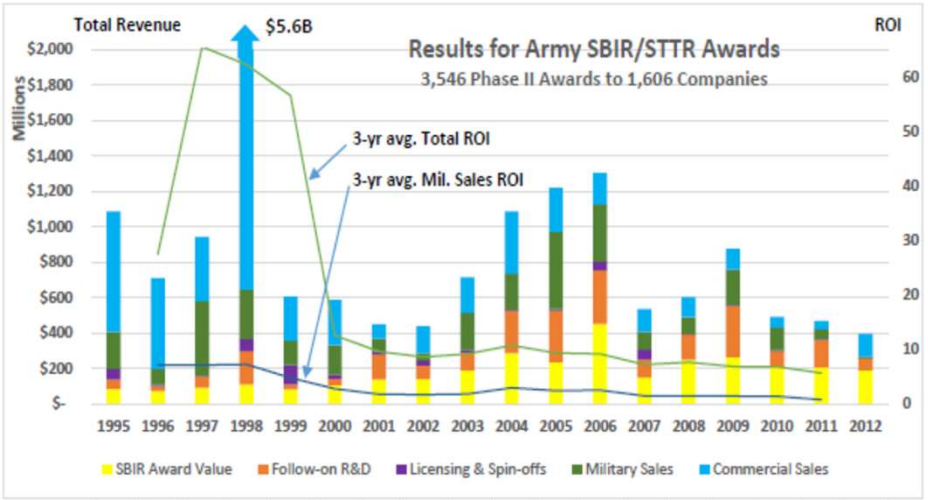
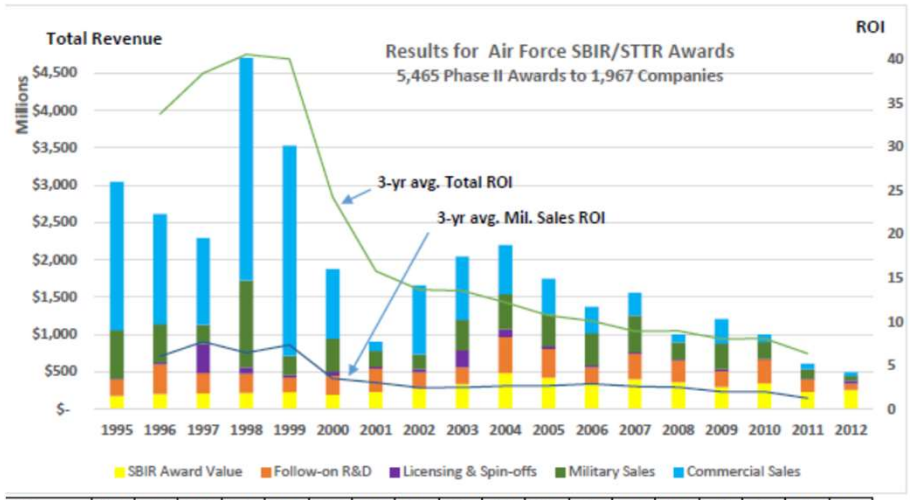
Component Results: Army & Air Force



# Awards:	136	114	119	140	102	124	154	158	208	290	227	474	147	235	263	220	235	200
1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	



# Awards:	219	246	248	259	254	213	237	268	324	492	419	357	376	386	312	361	243	251
1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	

- Large outlier in 1998 shifts average ROI for Army
- Note discontinuities for Army awards, 2005 to 2008 (possible contracting issues?)
- Noticeable drop in revenues and ROI for 2001 and 2002 Army awards
  - Possible result of post-9/11 deployments, reassignments of Army TPOCs and PMs, where SBCs lost program contacts

- Air Force revenue results generally larger, with larger ROI, than for Army (except for 1998). Note Total Revenue scale. Also note more AF awards.
- Large drop in revenue and ROI for 2001 awards
  - May reflect post-9/11 deployments and reassignments of TPOCs and other personnel, where less-experienced SBCs lost connections to DoD programs

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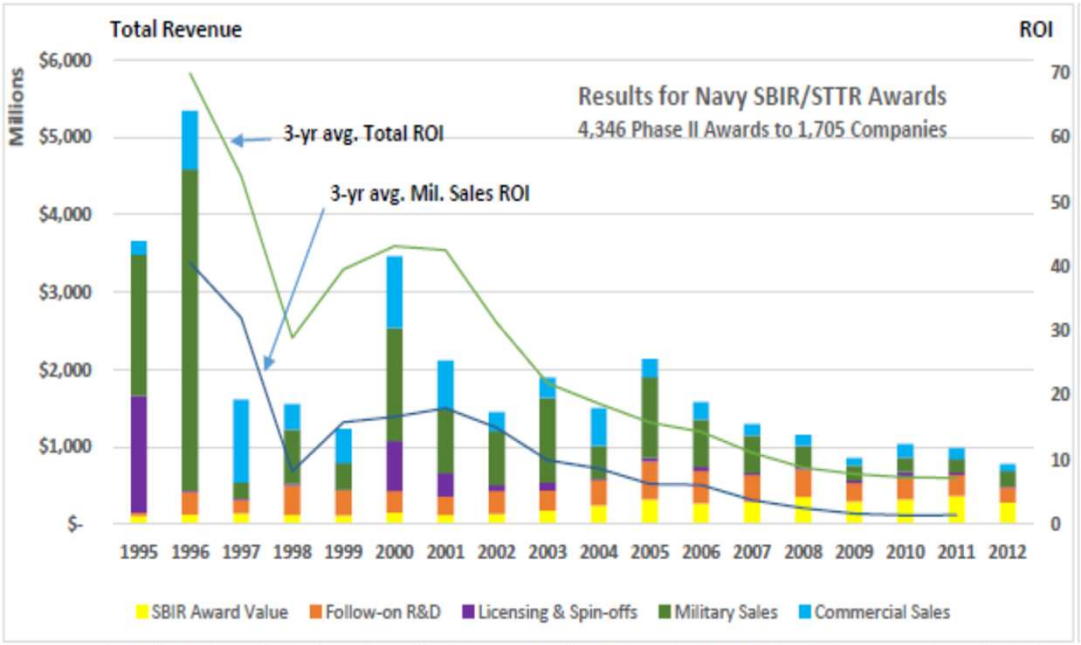
Component Results: Navy



# Awards:	159	180	186	167	143	184	146	160	205	270	311	262	262	355	314	356	384	302

- Navy shows high proportion of military sales
  - Exceed commercial sales for 15 of 18 award years
- Navy program structure demonstrably focused on military transition
  - Phase I topics coordinated with PEO/PM/FNC needs
  - Phase II Options require Technology Transition Plans and signed Technology Transition Agreements
  - Foremost use of Phase III contracts

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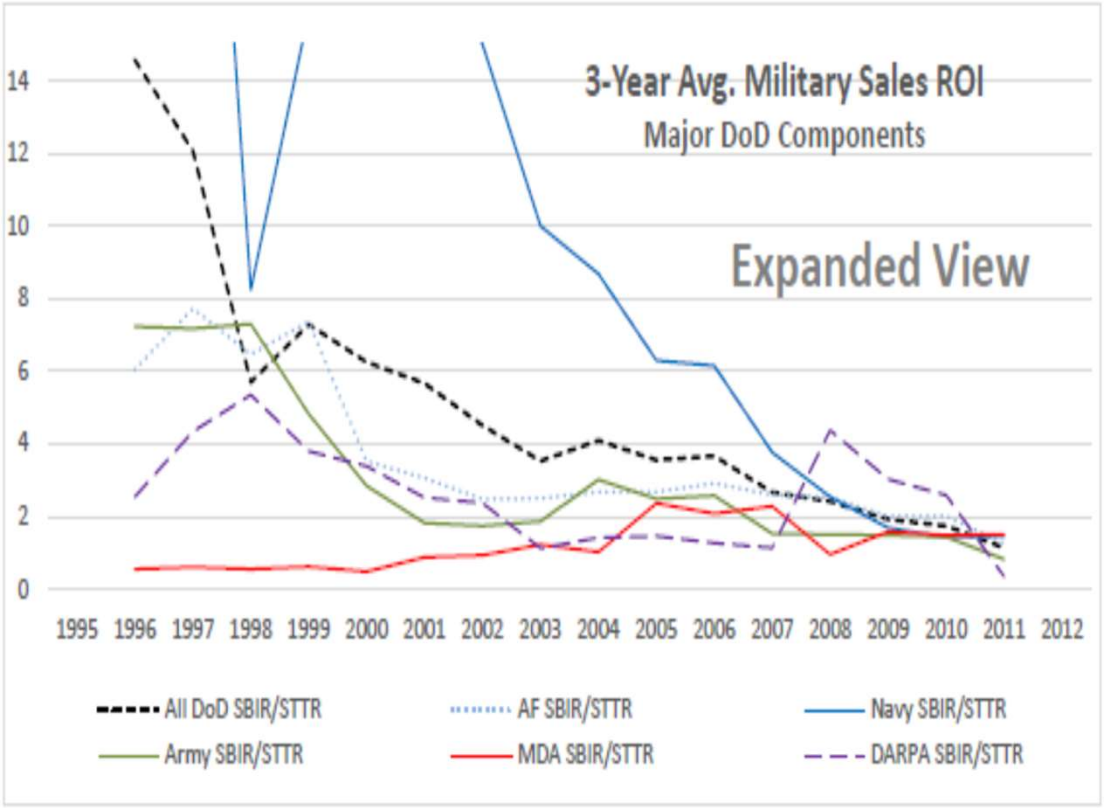
Component Comparisons: Mil. Sales ROI



- Military sales ROI is just total military sales, times economic multiplier, divided by award values
- Military sales ROI dominated by Navy, whose military sales were generally largest part of total sales
- DARPA newer award results are increased by 2009 outlier, plus additional fast-transition results from software tech
  - Note that 3-year running average distorts peaks

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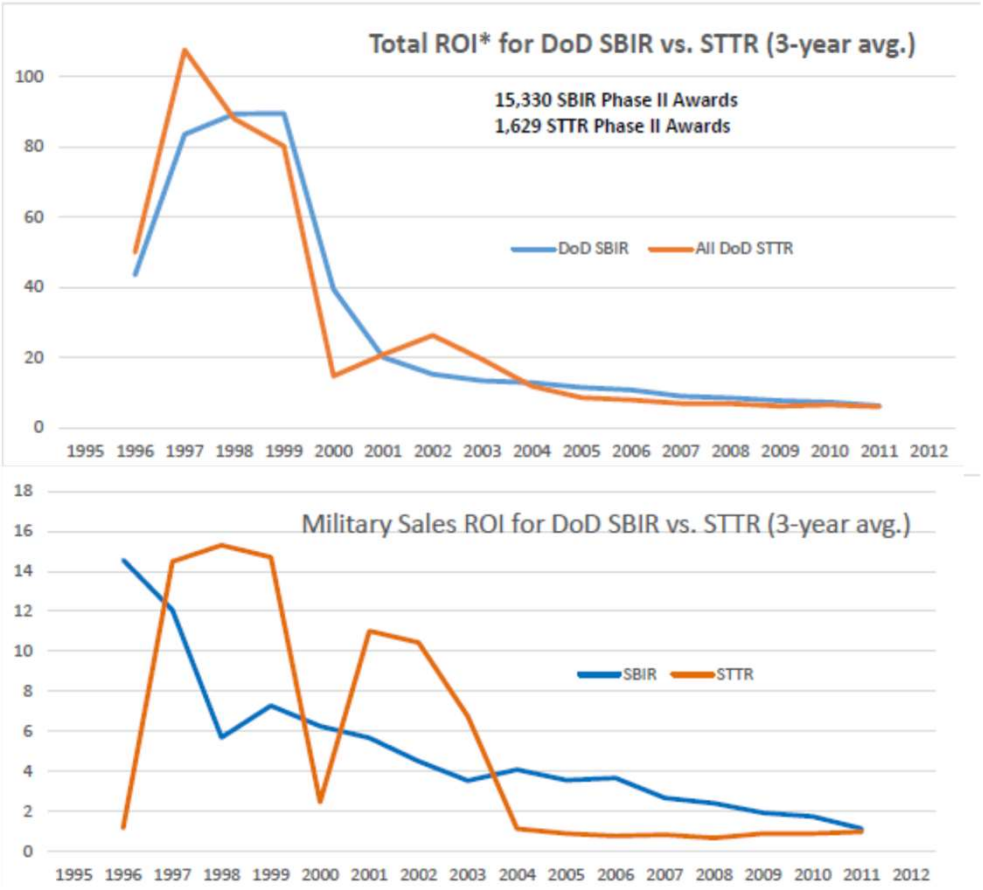
DoD STTR vs. SBIR ROI



- In general, STTR commercialization results comparable to those for SBIR.
- Fewer STTR awards lowers probability of large successes
- Overall military sales for STTR results generally comparable to SBIR
  - Except for relatively low military sales results for STTR after 2003

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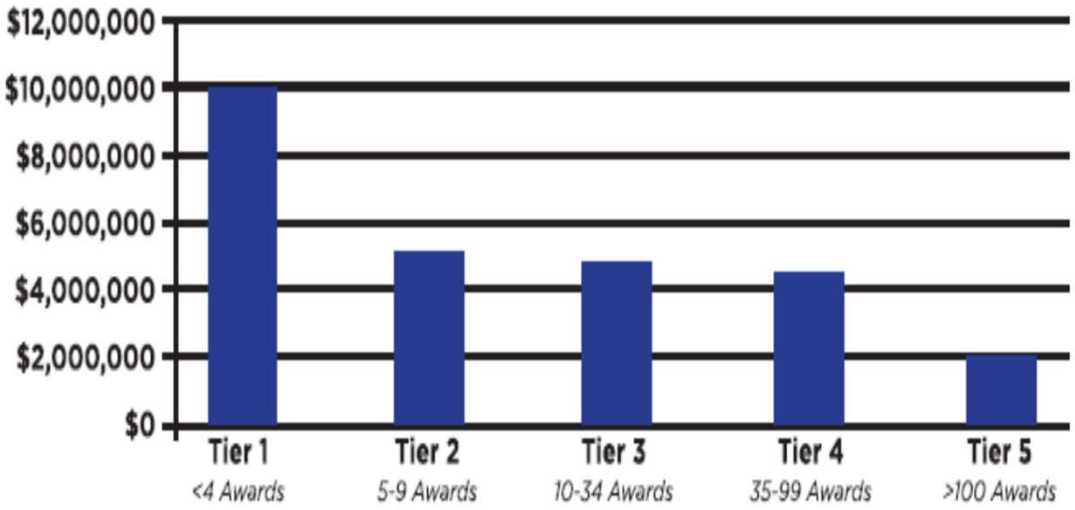
Prior Air Force Study: Results by Company Experience



Average Sales per Contract Achieving Sales Relative to Companies' Total Phase II Awards

- In 2014 Air Force SBIR/STTR study, companies were grouped into 5 "Tiers" based upon the total number of Phase II awards they had ever received, at any time up until 2013, from any agency (not just DoD)
- Tiers were defined as per chart, with Tier 5 being most experienced, having won more than 100 Phase II awards (per SBA awards database)
- Tier 1 firms (least experienced) averaged 5X the average sales results of Tier 5 firms, for contracts achieving sales
- Tier 1 firms had 4 out of 5 of the most successful results
  - Fifth was from a Tier 4 firm

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Example of SBIR First-timer Success

DoD Phase II led to Chips Powering Nearly All of Today's Wireless and Cellphone Technology

- 1998 DARPA Phase II for "GPS on a Chip" to Reza Rofougaran at Physical Research
- Founded Innovent Systems with sister Maryam in 2000, tech allowed GPS, Bluetooth and wireless on same chip
- 2002 Broadcom merger for $440M stock
  - Broadcom founder Henry Samueli was Reza's UCLA mentor
- Now at Movandi, both were named among "Top 5 Technology Innovators for 2017"

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Summary of Key Findings

- DoD SBIR/STTR Phase II awards (1995-2012) resulted in 22:1 ROI by 2018 (much higher now)
- Over 1.5 million job years resulted by 2018
- Over $121B in total sales of new products and services by 2018
- Over $28B in military sales in same period
- Nearly 60% of Phase II awards resulted in sales
- Many major successes for military, civilian and “Dual-use” applications
- Tax Revenues of $39.4B by 2018 was nearly triple initial Phase II investment of $14.4B, and continue to grow
- High ROI (5X to 10X SBIR award value) may require 4 to 12+ years after Phase II award, depending on technology

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