

# NATIONAL SECURITY INNOVATION ENTITIES

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## AN ANALYSIS & COMPARISON



**NOVEMBER 2024**

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## EXECUTIVE SUMMARY

The US national security community struggles to adopt emerging commercial technologies at the speed and breadth at which they are offered by industry. This potentially places national security missions at risk. Mitigating such risks to the volume, velocity, and value by which technologies transition from the commercial sector to fielded capabilities can translate to a real advantage in the global competitive environment.

Stemming from its mission at the intersection of science, technology, business, and government, the Potomac Institute conducted an independent study (September 2023 to April 2024) to assess enterprise innovation entities across the national security community. The study aimed to determine whether such organizations have made a difference in their mission to accelerate the adoption of emerging technologies and capabilities for mission-relevant applications. If so, how? If not, why not?

The study focused on a comparative analysis of four national security innovation entities: Defense Innovation Unit (DIU), AFWERX, SOFWERX, and In-Q-Tel (IQT). Potomac Institute researchers examined each entity's mission, organizational structure, authorities, funding models, and measures of effectiveness. The findings in this report are based on dozens of non-attributed interviews with senior subject matter experts throughout the national security and intelligence communities, the Department of Defense, industry, academia, and venture capital firms. Additionally, an extensive literature review identified best practices across the specified innovation entities.

Overall, the study concluded that **effective enterprise innovation entities require clarity of mission, robust communication lines, leadership top cover, and organic resources to improve chances of success**. More broadly, the study concluded that:

- Innovation entities should have a clear mission articulating their unique contribution (e.g., cross-cutting priorities) to enable the rapid adoption of innovative commercial technologies, differentiating them from other similarly focused organizations.
- The entity should be government-run, report to senior leadership of its parent organization, coordinate collaboration across multiple communities, and complement ongoing enterprise efforts.
- Innovation organizations should grow incrementally over several years while developing budget authorities substantial enough to attract companies that can provide mission-relevant technologies and capabilities.
- Measures of success will evolve over the years, with the speed of engagement (the time from first contact with an industry provider to a contract or agreement) emerging as a critical enabler.

## BACKGROUND

### *Defining the Problem*

Approaches to adopting new capabilities or innovative solutions for national security missions rely on acquiring specialized capabilities derived from pre-determined mission requirements, restrictive transaction authorities, and a limited set of vendors. This reliance leads to a mission capability adoption process that is generally slow, exclusionary, disparate, and uncoordinated, and favors incremental improvements over disruptive technologies. Consequently, shared insights into technology developments for cross-cutting capabilities become less likely. This situation leads to overlooked solutions, missed opportunities, duplicated efforts, reduced mission capability for end users, and limited Congressional oversight.

Despite improvements in recent years, current approaches for incorporating new capabilities and innovative technologies into national security missions fall short of matching the speed and breadth of commercial technology advances. This trend persists, even with the availability of an array of superb technical capabilities and organizations such as In-QTel, DIU, and AFWERX, as well as other units formed as initiatives to foster transformation and innovation. The primary criticism is that the nation's greatest resource—its human capital and innovation capacity—remains underutilized, and thus risks overlooking critical capabilities and leaving gaps for adversarial nations to gain warfighting and other critical advantages.

Furthermore, many innovative small and medium-sized companies that have not historically worked with the national security community feel sidelined. They complain the government is not easily accessible as a customer, which can limit consideration of their offerings despite perceived relevance to pertinent national security missions. Nonetheless, the desire to incorporate innovative technologies into national security systems to offset advantages of adversaries has been a recurring theme for many decades. Over the past ten years, the DoD has taken multiple actionable steps to address related issues by creating offices such as DIU, SOFWERX, and AFWERX (analyzed in this study). These efforts have resulted in national security innovation entities focused on military systems—but is that ecosystem effective?



## ANALYSIS OF FOUR NATIONAL SECURITY INNOVATION UNITS

To understand the impact and effectiveness of the national security innovation ecosystem, it is instructive to consider the experience of government agencies that previously established innovation organizations to accelerate the adoption of emerging technologies and capabilities for their missions. To that end, the Institute conducted a comparative analysis of four existing innovation unit models, namely AFWERX, DIU, SOFWERX, and InQTel. The analysis compares the missions, organizational structures, operational authorities, funding models, and effectiveness metrics of each of these units.

Despite their differences, certain common themes were discerned among the four entities. This section summarizes the attributes of the four innovation entities, followed by observations concerning their development important to their success.

The four innovation units examined:

- Defense Innovation Unit (DIU),
- AFWERX,
- SOFWERX, and
- In-Q-Tel, Inc.

Table 1 provides a high-level summary of the attributes of the four selected organizations. The table describes each organization in terms of six properties. In many cases, these attributes changed over time as the organizations developed. The evolution is discussed in subsequent sections. The properties for each organization are:

- **Mission:** Stated purpose of the organization and functions needed to fulfill that purpose;
- **Organizational structures:** Governance, the parent organization, subsidiaries, and reporting structure;
- **Operational authorities:** Authorities granted by law and/or designation from parent organizations that permit actions;
- **Funding model:** Funding appropriated, how much, and how disbursed;
- **Effectiveness metrics:** How the organization measures success and thus communicates how it is doing; and
- **Unique Characteristics:** Attributes that are different with this innovation organization.

The following section elaborates on the attributes of each of the four organizations presented in Table 1.

Table 1: Comparison Table of Four Innovation Entities

	MISSION	ORGANIZATIONAL STRUCTURE	OPERATIONAL AUTHORITIES	FUNDING MODEL	EFFECTIVENESS METRICS	UNIQUE CHARACTERISTICS
<b>DIU</b>	<ul style="list-style-type: none"> <li>- Accelerates DoD adoption of commercial technology</li> <li>- Transforms military capacity and capabilities</li> <li>- Strengthens the national security innovation base</li> </ul>	<ul style="list-style-type: none"> <li>- OSD org, reports to the SecDef</li> <li>- Oversees NSIN and NSIC</li> <li>- Maintains eight lines of effort including a focus on critical capabilities and warfighter needs</li> <li>- Consists of a mix of active duty military, reservists, civilians, and contractors; requesting more staff</li> <li>- Has five offices in Mountain View, Boston, Austin, Chicago, and the Pentagon</li> </ul>	<ul style="list-style-type: none"> <li>- Codified by Congress, SecDef approved DIU 3.0 plans</li> <li>- Serves as the primary staffing element of the DIWG</li> <li>- Primarily leverages OTAs and non-diluted capital</li> </ul>	<ul style="list-style-type: none"> <li>- Executes an annual \$983M+ Congressionally appropriated budget</li> </ul>	<ul style="list-style-type: none"> <li>- Reports several metrics, not all on effectiveness.</li> <li>- Speed of execution, the amount of private sector investment leveraged, and the number and percentage of prototype programs transitioned to a fielded capability that could be employed by the warfighter</li> <li>- Revisiting metrics in 3.0</li> </ul>	<ul style="list-style-type: none"> <li>- Founded in 2015</li> <li>- Reports directly to SecDef</li> <li>- &lt; \$1B budget</li> <li>- Phases of development: as of 2023, on DIU 3.0, which focuses on fielding at scale</li> </ul>
<b>AFWERX</b>	<ul style="list-style-type: none"> <li>- Accelerates agile and affordable capability transitions by teaming leaders in innovative technology with Airman and Guardian talent</li> </ul>	<ul style="list-style-type: none"> <li>- A directorate within AFRL, and reports to the Air Force Service Acquisition Executive</li> <li>- Operates four core arms: AFVentures, Spark, Prime, and SpaceWERX</li> <li>- Consists of a mix of military, civilian, and contractor personnel</li> <li>- Has seven hubs and 108 Spark Cells across the US</li> </ul>	<ul style="list-style-type: none"> <li>- Established as innovation arm of the DAF</li> <li>- Manages the DAF SBIR/ STTR under AFVentures' three programs: Open Topic, Specific Topic, and STRATFI/ TACFI</li> </ul>	<ul style="list-style-type: none"> <li>- Executes an annual \$1.4B Congressionally appropriated budget</li> <li>- Since 2019, has executed 6,028 contracts worth more than \$4B</li> </ul>	<ul style="list-style-type: none"> <li>- AFWERX uses both quantitative and qualitative metrics that tie value to the user and impact on mission. No single set of metrics will be appropriate for all solutions.</li> <li>- Records SBIR contracts picked up by PEOs</li> </ul>	<ul style="list-style-type: none"> <li>- Founded in 2017</li> <li>- Operates four Programs: AFVentures, Spark, Prime, and SpaceWERX.</li> <li>- Hosts competition and prize challenges for Airmen and Guardians</li> <li>- Executed over \$4B worth of contracts</li> <li>- Phases of development: As of 2023, on AFWERX 3.0, which increases funding and expands existing resources</li> </ul>



	MISSION	ORGANIZATIONAL STRUCTURE	OPERATIONAL AUTHORITIES	FUNDING MODEL	EFFECTIVENESS METRICS	UNIQUE CHARACTERISTICS
SOFWERX	<ul style="list-style-type: none"> <li>- Creates and maintains a platform to accelerate delivery of innovative capabilities to USSOCOM</li> <li>- Facilitates capability refinement through exploration, experimentation and assessment of promising technology</li> </ul>	<ul style="list-style-type: none"> <li>- Has Partnership Intermediary Agreement (PIA) between USSOCOM and the nonprofit DEFENSEWERX, oversight through SOF AT&amp;L, and on-site PM</li> <li>- As of 2021, staffing includes about 21 DEFENSEWERX employees, industry fellows, academic interns, and three PMs</li> <li>- Office in Tampa, Florida</li> </ul>	<ul style="list-style-type: none"> <li>- Granted PIA authority from 15 U.S.C. 3715</li> <li>- Executes commercial non-FAR subawards, including several Collaborative Project Orders, CRADA, OTA, SBIRs, Prize Challenges</li> </ul>	<ul style="list-style-type: none"> <li>- In 2018, had annual budget of about \$4M</li> <li>- As of March 2024, contracted \$196.5M through 967 purchase orders to date</li> </ul>	<ul style="list-style-type: none"> <li>- Uses four core metrics: Transitions to PoR, consignment/adoption, knowledge transfer to SOCOM, and validation of concepts</li> </ul>	<ul style="list-style-type: none"> <li>- Founded in 2015</li> <li>- Operates as PIA</li> <li>- Holds prize challenges, collider events, "Tech Tuesday"</li> </ul>
IN-Q-TEL	<ul style="list-style-type: none"> <li>- Identifies and delivers cutting edge technologies to the US intelligence community (IC) to enable IC agencies to carry out their national security missions</li> </ul>	<ul style="list-style-type: none"> <li>- An independent, non-profit, venture capital corporation</li> <li>- Has an Interface Committee liaison with CIA and others (partners with CIA, FBI, NSA, NGA, NRO, CBP, DHS, and other DHS components, DIA, U.S. Cyber Command, and Air Force)</li> <li>- Operates four labs: Lab41, CosmiQ Works, B.Next, and Cyber Reboot</li> <li>- Staff includes PMs, technical and financial performers</li> <li>- Offices in Washington D.C., Menlo Park, Boston, London, Sydney, Singapore, Munich</li> </ul>	<ul style="list-style-type: none"> <li>- Uses capital investments, warrants, joint ventures, sole source awards, and OTAs</li> <li>- Invests via equity stake and work programs and offers IP protection to portfolio companies</li> </ul>	<ul style="list-style-type: none"> <li>- Receives approximately \$100M in government funding annually</li> <li>- Investment fund of \$1B (small for a venture capital firm); \$166M recorded revenue in 2021</li> <li>- Makes 12-30 investments annually ranging from \$500,000 to \$3M per company (plus seed investments from \$250,000-\$500,000)</li> <li>- Reports leveraging \$28 private-sector investment for every \$1 it invests</li> </ul>	<ul style="list-style-type: none"> <li>- Records mission use (e.g., 75% investments have been field-tested by government partners)</li> <li>- Records impact (e.g., 50% of investments have been adopted for use)</li> <li>- Estimates future capability building and end-user impact</li> </ul>	<ul style="list-style-type: none"> <li>- Founded in 1999</li> <li>- Has a IOT Interface Committee in IC agencies to understand agency-specific problems</li> <li>- Combs tech firms for commercial tech adaptations, custom, and new solutions</li> <li>- Can invest equity stake</li> <li>- Occupies senior advisory seat on company's Board</li> <li>- Not prohibited from investing in non-US companies</li> </ul>

## Defense Innovation Unit (DIU)

**Mission:** DIU's mission is to "Accelerate DoD adoption of commercial technology, transform military capabilities and capacity and strengthen the national security innovation base."<sup>1</sup> DIU is, according to its literature, "the only DoD organization focused exclusively on fielding and scaling commercial technology across the US military at commercial speeds."<sup>2</sup> The Secretary of Defense (SecDef) founded DIU in 2015 as DIUx (Defense Innovation Unit experimental) to maintain technological superiority in the face of a shifting threat environment.<sup>3</sup> DIU's role has evolved through multiple generations. The most recent iteration, DIU 3.0, established in 2023, focuses on filling critical gaps and rapidly scaling technologies into capabilities, enabled in part by embedding DIU staff in the US Combatant Commands. Notably, DIU 3.0's mission differs from its initial (experimental) phase, roughly eight years earlier.

**Organizational Structure:** DIU was deliberately based in Silicon Valley (Mountain View), with hubs in Boston, Austin, Chicago, and the Pentagon, manned by a mix of active duty military, civilians, and contractors. Starting in May 2023, DIU's Director reports directly to the Secretary of Defense (SecDef) and effectively to the Deputy Secretary of Defense, with administrative support from the OUSD R&E.<sup>4,5</sup> During its early development, DIU changed reporting structure several times—first reporting to the SecDef, then to an Assistant Secretary, and later to an Undersecretary, resulting in its current split structure.<sup>6</sup> A Defense Innovation Board was formed in 2016, around the same time DIUx was stood up. While formally independent of DIU, the Board provides advice to both OSD and DIU.<sup>7</sup> In 2019, DIU assumed responsibility for the National Security Innovation Network (NSIN) (formerly known as the MD5 National Security Technology Accelerator), and in 2021, DIU launched the National Security Innovation Capital (NSIC).<sup>8,9</sup> DIU's 3.0 plans include eight lines of effort (LOEs),<sup>10</sup> with directors for each, and is focused on transitioning capabilities for warfighters.<sup>11</sup>

**Operational Authorities:** The Secretary of Defense approved the 3.0 iteration of DIU, which Congress codified as the principal liaison between the Pentagon and the commercial technology sector.<sup>12</sup> DIU also serves as the primary staffing element for the Defense Innovation Working Group (DIWG), which aids the Deputy's Innovation Steering Group (DISG). These groups will assist DIU in rapidly executing solutions for operational problems, especially using the DIU Fielding Fund (approved in the FY24 Appropriations Act), as well the *Replicator Initiative*.<sup>13</sup>

Stood up in 2015, DIU began with insufficient authorities and funding. It took until 2019 for DIU to gain direct contracting authorities.<sup>14</sup> Early in its development, concern arose over a lack of resources and connections to other DoD R&D elements.<sup>15</sup> Over its first five years, DIU received new hiring authorities, gained a reserve detachment, and obtained an authorization to use Other Transaction Authorities (OTAs) to award funds to nontraditional companies. However, funding levels remained below the administration's requests, driving questions about DIU's effectiveness and proper size.<sup>16</sup> Internal conflicts led to a complaint to the DoD Inspector General concerning contracting, hiring, and personnel practice,<sup>17</sup> which was later dismissed. The 2021 DIU annual report indicates over 200 staff assigned,<sup>18</sup> including civilians, active duty and reserve military personnel and contractors, but insufficient funding led to frustrations. After facing budget and staff cuts in FY22, the director resigned and publicly complained about the lack of support from the Pentagon.<sup>19</sup>

With a new director in April 2023, DIU requested an increase in staffing levels,<sup>20</sup> and a greatly expanded budget (nearly \$1 billion), which was appropriated (in specific program elements) in March of 2024.

**Funding Model:** In its initial phases, DIU was funded by a mix of O&M funding and a modest amount of RDT&E funds, also leveraging other DoD funds for contracts and agreements with suppliers. The appropriated RDT&E funds fluctuated between around \$10 million and \$50 million (through FY21), typically around \$30 million.<sup>21</sup> Throughout this time, however, DIU leveraged other account lines to issue agreements (OTAs) with higher ceilings.<sup>22</sup> In FY23, Congress appropriated approximately \$112 million,<sup>23</sup> with \$191 million available across multiple accounts.<sup>24</sup>

For FY24, DIU funding increased to \$589.4 million for “DIU fielding” and \$131.9 million for prototyping in addition to an appropriation of \$225.2 million (an increase above the budget request of \$104.7 million), for a total budget close to \$1 billion.<sup>25</sup> These amounts are designated in specific program elements. DIU continues to fund companies largely via OTAs<sup>26</sup> and a competitive defense procurement process called Commercial Solutions Openings (CSOs).<sup>27</sup> Prototype OTA awards are eligible for follow-on funding as Production Other Transactions (OTs), which DIU is using for transition efforts.<sup>28</sup>

**Effectiveness Metrics:** DIU defines technology transition as the instance wherein a prototype receives funding for follow-on production, either as a Production OT or under a Federal Acquisition Regulations (FAR)-based contract. The DIU FY22 Annual Report describes 17 such transitions with a total value of \$1.3 billion.<sup>29, 30</sup> Funding can come from other programs, or going forward, may come from the DIU Fielding Fund. Transition funding does not necessarily translate to a technology being fielded for operations.

DIU’s measures of success have evolved through its organizational iterations. Historically, DIU reported results using metrics that included number of solicitations, number of proposals received, prototype OTA contracts awarded, days to award, speed of execution, private investment leveraged, and transitions to DoD end users, as well as the absolute number and percentage of prototype programs transitioned to a fielded capability that could be employed by warfighters. The DIU 3.0 strategic plan released in February 2024 indicates that the metrics going forward will be based on a “...focus on the [US military’s] most critical capability gaps that are central to the US ability to deter and win wars...” In this phase, DIU will also “deepen its partnerships across the Defense Department so that successful prototypes are ready to scale and transition into the force.”<sup>31</sup>



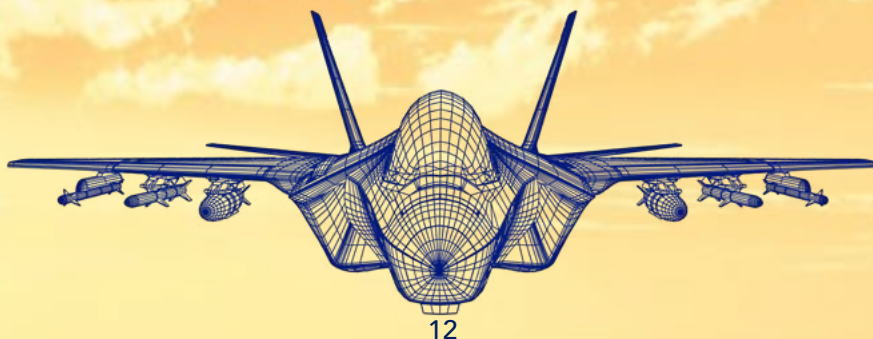
## AFWERX

**Mission:** AFWERX is an endeavor by the US Air Force to collaborate with small and non-traditional businesses. It was established in 2017, but as with DIU, went through multiple iterations to become AFWERX 2.0 (in 2021) and AFWERX 3.0 in 2022. AFWERX’s mission, as stated in May 2023, is to “accelerate agile and affordable capability transitions by teaming leaders in innovative technology with Airmen and Guardian talent.”<sup>32</sup> As the innovation arm of the Department of the Air Force and a directorate within the Air Force Research Laboratory, AFWERX solicits small businesses to submit innovative solutions to open solicitations that are broad in scope and include topics that have not yet been formally identified as a need by Airmen and Guardian end users.<sup>33</sup>

**Organizational Structure:** AFWERX is a directorate within Air Force Research Laboratory (AFRL), reporting to the AFRL Commander, and ultimately to the Air Force Service Acquisition Executive (SAF/AQ). With seven hubs across the nation, AFWERX manages (since September 2020) the Department of the Air Force’s Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.<sup>34</sup>

AFWERX consists of three major divisions: AFVentures, Spark (formerly AFWERX 1.0), and Prime (formerly Agility Prime). SpaceWERX is also a part of AFWERX located at the AFWERX hub in Los Angeles, with its own Space Ventures, Space Spark, and Space Prime. According to their own description, AFVentures and Spark serve as the primary gateways for innovation. By late FY23, AFWERX consisted of 325 people in a mix of military, civilian, and contractor personnel.<sup>35</sup>

**Operational Authorities:** As the innovation arm of the Department of the Air Force (DAF), AFWERX manages DAF SBIR/STTR set-aside funds, per federal SBIR/STTR program guidelines. The use of an Open Topic in an SBIR solicitation is an innovation of the AFWERX procurement process, which the Government Accountability Office (GAO) noted as having “success in some areas” by 2020.<sup>36</sup> The SBIR program involves three phases of development. The Strategic Funding Increase (STRATFI) program permits additional SBIR funding in an extended Phase II process to attempt to bridge the “valley of death” from prototype to development and into production, requiring a Small Business Administration exemption if the total Phase II allocation exceeds a certain threshold. Phase III funding, however, still must come from non-SBIR sources.<sup>37</sup> AFWERX can also use OTAs to award funds.



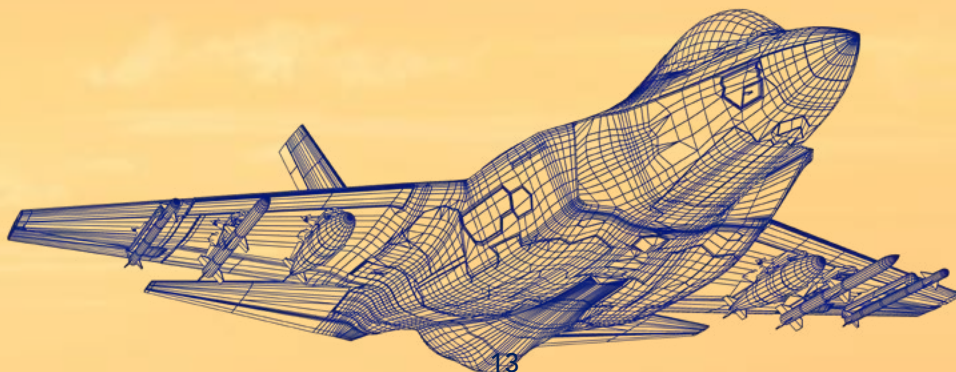
**Funding Model:** AFWERX executes an annual \$1.4 billion budget. Since 2019, it has executed over 6,000 contracts worth more than \$4 billion. AFWERX has access to a large portion of the DAF's set-aside for the Small Business Administration's SBIR/STTR program, amounting to 3.2% of the total DAF extramural R&D budget,<sup>38</sup> or more than a billion dollars each year. AFWERX leverages other program funds across the Department for Phase III funding and leverages private investment funds to commercial companies. The STRATFI and the Tactical Funding Increase (TACFI) programs can provide additional SBIR funds after a small business' Phase II effort, to bridge a "valley of death," for example. The STRATFI/TACFI program alone, in 2024, accounted for a total of \$193 million in SBIR/STTR funds, \$419 million in government matching funds, and \$187 million in private matching funds.<sup>39</sup>

AFVentures uses SBIR/STTR funds to invest in small businesses via an open topic and specific topic solicitations.

Spark provides funds to individual cells (108 cells as of 2022) of Airmen (or Guardians) at bases throughout the DAF to engage with industry innovators to solve specific problems. Modeled after commercial venture capital development structures, AFWERX seeks grassroots solutions to Air and Space Force challenges using the Spark program to organize government and industry collider events, Spark Tank competitions, the Spark Fellowship, Spark Augmentee Program, and Spark Collider Program.<sup>40</sup>

AFWERX Prime is an industry accelerator focused on expanding technology transition paths using the resources of other agencies.<sup>41</sup> Originally dubbed "Agility Prime," its aim was to accelerate the commercial development of electric vertical lift aircraft (eVTOL) using OTAs, which included a major award (\$55 million) to eVTOL developer Joby.<sup>42</sup> AFWERX Prime since launched "Integration Prime" and "Autonomy Prime" using their "Innovative Capabilities Opening" process with the intent to award contracts via OTAs.<sup>43 44</sup>

**Effectiveness Metrics:** AFWERX captures quantitative and qualitative metrics tied to user value and mission impact, according to the Air Force Innovation Handbook (2021). Ideally, an SBIR/STTR award results in a capability that transitions to the field, and tracking such instances is a reasonable measure of success. However, the most common metric used by AFWERX is the number of SBIR contracts that are picked up by a Program Executive Office (PEO).<sup>45</sup> They also track the number of new companies funded and total contract ceiling amounts for non-SBIR funding.<sup>46</sup>



## SOFWERX

**Mission:** Founded in 2015, SOFWERX serves as an innovation platform for the US Special Operations Command (USSOCOM) with the stated goal of supplying USSOCOM Operators with an inventory of advanced technologies that can address the challenges faced by the warfighter in the field.<sup>47</sup> Emphasis is placed on engaging and incorporating small businesses, entrepreneurs, and other nontraditional DoD creative talent in the innovation process.<sup>48</sup> SOFWERX's charter is two-fold: 1) Create and maintain a platform to accelerate delivery of innovative capabilities to USSOCOM and 2) Facilitate capability refinement through exploration, experimentation, and assessment of promising technology.<sup>49</sup>

**Organizational Structure:** Located in Tampa, Florida, SOFWERX reports to Special Operations Command.<sup>50</sup> SOFWERX is a Partnership Intermediary Agreement (PIA) between USSOCOM and a nonprofit entity called DEFENSEWERX that engages academia and industry on behalf of the government with oversight through Special Operations Forces, Acquisition Technology, & Logistics (SOF AT&L) and an onsite Program Manager (PM).<sup>51</sup> SOFWERX engages in a variety of discovery, engagement, and acceleration activities such as prize challenges, prototyping (in the SOFWERX internal Foundry),<sup>52</sup> experimentation, and combat evaluations, distributing USSOCOM funding as an intermediary. Staffing has increased from around 20 personnel in 2017, including DEFENSEWERX employees, industry fellows, academic interns, and three program managers,<sup>53</sup> to around 70 personnel today.<sup>54</sup>



**Operational Authorities:** The SOFWERX PIA gains its authority from 15 U.S.C. 3715, as a "...contract or memorandum of understanding with a partnership intermediary that provides for the partnership intermediary to perform services for the Federal laboratory that increase the likelihood of success in the conduct of cooperative or joint activities of such Federal laboratory with small business firms, institutions of higher education...or educational institutions..."<sup>55</sup> As such, SOFWERX enters into FAR or non-FAR based agreements with industry, academic, and National Lab partners whose solutions are evaluated by government Subject Matter Experts (SMEs) from PEO-SW.<sup>56</sup> The commercial non-FAR subawards include Collaborative Project Orders (CPOs), Cooperative Research and Development Agreements (CRADAs), OTAs, and Prize Challenges.<sup>57</sup>

**Funding Model:** SOFWERX has a modest annual operating budget of a few million dollars.<sup>58</sup> It primarily uses USSOCOM funds to issue contracts and awards, which according to its website, amounts to about \$200 million in awards via approximately 1,000 purchase orders and business-to-business agreements, spanning from its inception in 2015 through 2023.<sup>59</sup> USSOCOM also allocates 10% of its SBIR funds (which amounts to a couple million dollars) in a collaborative project task order with SOFWERX, so SOFWERX can incorporate those funds into its commercial agreements,<sup>60</sup> providing added flexibility for small grants.

**Effectiveness Metrics:** SOFWERX tracks its "ecosystem" through metrics that include discovery and engagement events, social media followers, and number of awards through its SBIR funds. It tracks four metrics to measure potential impact: transitions to a Program of Record (PoR), consignment/adoption of technology, knowledge transfer from industry to USSOCOM, and validation of ideas and concepts.<sup>61</sup>



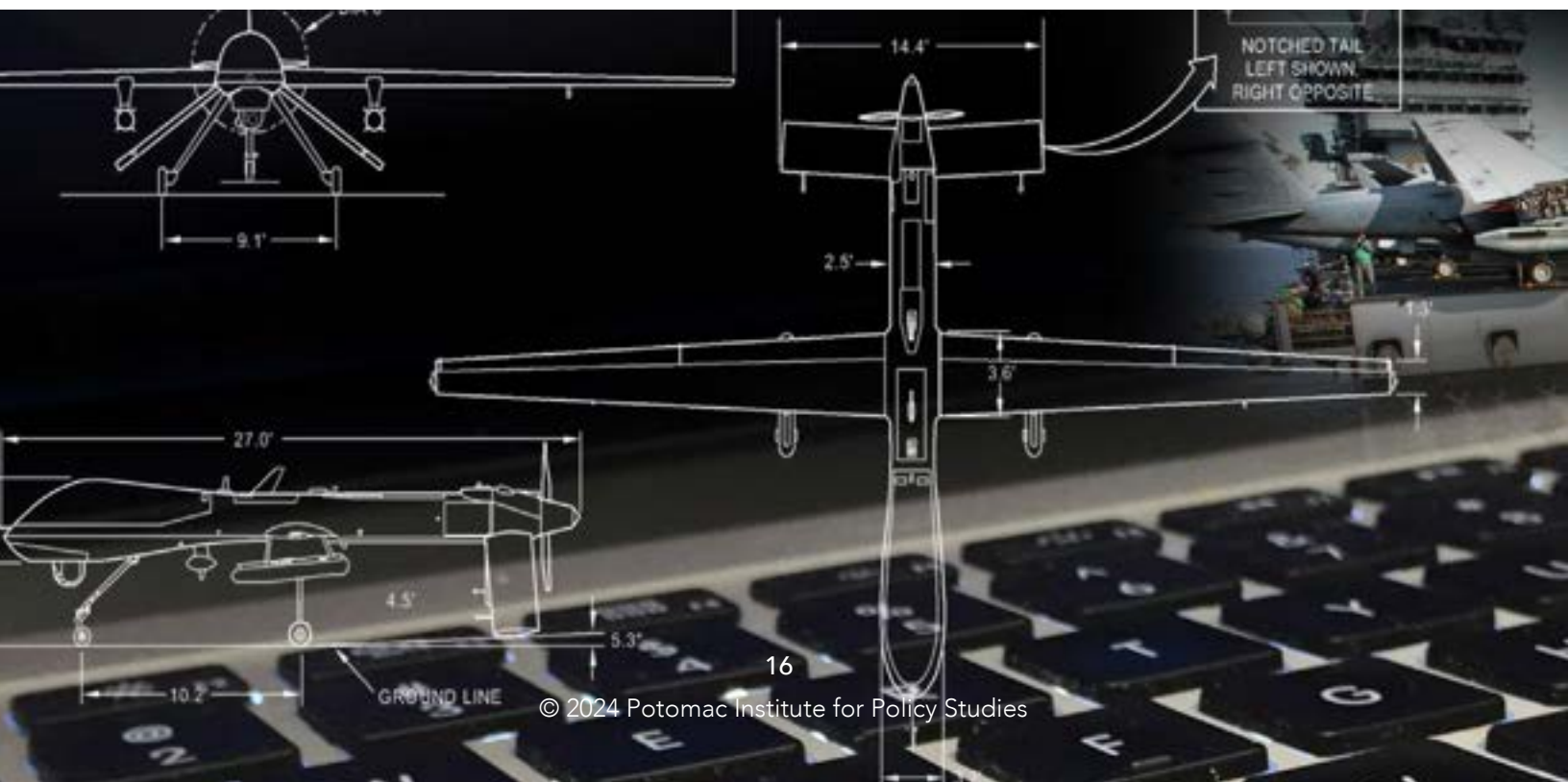
## IN-Q-TEL

**Mission:** In February 1999, the CIA chartered In-Q-Tel as a private, independent, nonprofit venture capital firm. The mission is to exploit and deliver (through the private sector) new and emerging information technologies for the intelligence community (IC). At the time of its inception, the “dot-com” revolution and private-sector technology was far outstripping government innovation,<sup>62</sup> and so In-Q-Tel (then In-Q-It) was established and funded to identify and deliver cutting-edge technologies to the US IC. In-Q-Tel is also said to carry the institutional history of IC innovations, given its 25 years of working across the IC member elements.<sup>63</sup> In-Q-Tel continues to focus on information technologies, such as AI and machine learning, but has also focused on other technology applications, including cybersecurity, space, batteries, and quantum.<sup>64</sup>

**Organizational Structure:** In-Q-Tel engages in technology scouting, venture investing, and advising on behalf of the US intelligence and national security communities in the form of an independent, not-for-profit, venture capital organization.<sup>65</sup> In-Q-Tel manages four labs (Lab41, CosmiQ Works, B.Next, and Cyber Reboot)<sup>66</sup> and assists in performing due diligence and interacting with companies and the government.<sup>67</sup> In-Q-Tel is based in Arlington, VA, with additional offices in Menlo Park, Boston, London, Sydney, Singapore, and Munich.<sup>68</sup> The staff of over 100 includes non-government project managers, technical operators, and financial investors.

In-Q-Tel is formally independent of the government but bound by agreements with its contract from the CIA. It is able to invest in companies using its capital funds and private investments via In-Q-Tel staff and external investors.<sup>69</sup> In-Q-Tel managers co-invest in portfolio companies as private investors.<sup>70</sup>

In-Q-Tel maintains “In-Q-Tel Interface Centers” (QICs) that serve as the link between In-Q-Tel and IC agencies.<sup>71</sup> QICs help facilitate a collaborative process known as the “Q Process” to match In-Q-Tel technology investments to IC needs. Throughout the Q process of problem definition, piloting, and deployment, In-Q-Tel staff serve as interlocutors between business and government





by interacting with both parties over issues like engineering, pricing, and tech installation.<sup>72</sup> With each investment, In-Q-Tel assumes an advisory position on a company's board of directors and serves as a general advisor.<sup>73</sup>

**Operational Authorities:** In-Q-Tel uses capital investments, warrants, joint ventures, OTAs, and sole source awards to fund companies in its portfolio. It operates in the absence of federal acquisition regulations as an independent investor, with the ability to invest in multiyear increments and to make a profit from the sale of equities. Many of its investments are held as proprietary information to maintain the distinction from a CIA association.<sup>74</sup> In-Q-Tel provides IP protection to portfolio companies and is not prohibited from investing in non-US companies.<sup>75</sup> Government funds provided to In-Q-Tel purchase influence over technology development pathways, and not IP nor government ownership.

**Funding Model:** Each IC element contributes to the funds In-Q-Tel receives annually from the government, totaling approximately \$100 million. In-Q-Tel's nonprofit filing shows an investment fund of a billion dollars (which is small for a venture capital firm); in 2021, it recorded revenue of \$166 million.<sup>76</sup> In-Q-Tel makes 12-30 investments annually<sup>77</sup> that range from \$500,000 to \$3 million per company (plus seed investments that range from \$250,000-\$500,000).<sup>78</sup> In-Q-Tel claims that for every \$1 invested, it leverages \$28 in private-sector investment.<sup>79</sup>

**Effectiveness Metrics:** In-Q-Tel tracks mission use (e.g., 75% of investments have been field-tested by government partners) and impact (e.g., 50% of investments have been adopted for use). Qualitatively, they record future capability building<sup>80</sup> and estimate impact ratings from end-user agencies through interviews and survey methodology.<sup>81</sup> As investors, In-Q-Tel is concerned with revenue from investment gains, but can also sustain capital losses (investment failures) due to government funding.



## OBSERVATIONS AND LESSONS FROM INNOVATION UNITS

The four subjects of this study, DIU, AFWERX, SOFWERX, and In-Q-Tel, present four distinct models for structuring an innovation organization focused on delivering commercial technologies for national security. Given the rapid growth of such organizations across government and in the commercial sector, most of which have a nuanced approach to their mission, it is safe to conclude there is no single best model. Nor are the attributes of an existing model effectively transferable to another model; choices must be made based on the unique needs and gaps presented by the application domain.

### *Long Establishment Timeline*

Each of the four subject organizations developed and matured over a period of years, and often saw changes in leadership and direction as the organization matured. The mission of an innovation organization depends on its level of evolution as well as the needs of the organization it serves. Moreover, despite desires for innovation organizations to move fast and cut through the red tape associated with procuring new capabilities, it can take years for an organization to succeed with a technology transition.

### *Transition Challenges*

To varying degrees, each subject organization of this study faced challenges in transitioning new capabilities to operational use. DIU now has a substantial transition fund dedicated to this purpose but existed without such a fund for the first nine years of its existence. Discovering and developing a technology is just the start in making it available to end users. Early and frequent contact with intended end users is necessary for successful transitions, and resources may be required for training and acceptance of the capability. Each of the innovation units studied here have channels to communicate closely with their potential user community.

### *Funding*

Different innovation units have different funding levels and models, but tend to have dedicated funding for operations in addition to funds used for contracts or agreements with companies. The latter can be a mix of funds appropriated for research and development, and/or monies leveraged from other sources. In some cases, the RDT&E funds are from SBIR/STTR set-asides from a parent organization. In other cases, they are appropriated to the organization. These funds often are targeted for small and medium-sized businesses. Other sources can include funds from major defense acquisition programs or funds from program executive offices intended to find solutions to distinct operational problems. Venture capital firms can take cues from government investments when considering where to place their own private investments. However, that interest is usually only piqued in the innovation ecosystem if it presents a critical mass of available funding.

## *Moving Money Quickly*

Each of the innovation units studied here employ techniques that move money quickly to companies, each accompanied by varying degrees of risk, and use different methods, like “Other Transaction Authorities” (OTAs) to accelerate the acquisitions process. Organizations based on PIAs can move money faster than typical government solicitations again through the use of OTAs. Having an in-house contracting authority (or an organic capability to enter into agreements) is also important to speeding the process of executing grants.

## *Authorities and Top Cover*

The four study subject organizations enjoy a range of support from their parent organization, which often depends on the reporting structure. In the case of DIU and AFWERX, the organization has changed over time between reporting to the highest levels and reporting to subordinate organizations. Based on discussions with participants in the organizations, having the director report to a senior level is important to mission effectiveness. In the case of DIU, the director reports directly to the Secretary of Defense, with administrative functions covered by the office of the Undersecretary of Research and Engineering.

Senior level top cover can provide the director, and thus the organization, with bolstered perceived authority, which translates to operational effectiveness. It can also help with talent recruitment, particularly of the director, and reduce internal conflicts. It is important in deconflicting lanes of activity, and in mollifying “antibodies” to the innovation organization’s role or even its mere existence. While the sample size here is small and the evidence is limited, a reporting structure that includes senior levels of the parent organization or department seems to be beneficial to the evolution and operation of the innovation entity.



## SUMMARY: ELEMENTS OF SUCCESSFUL INNOVATION ORGANIZATIONS

As a part of this study, non-attributational interviews were conducted with SME and other stakeholders in the innovation space to capture lessons learned regarding the character and nature of effective innovation-focused organizations. Observations provided here specifically represent the opinions of those familiar with the formation of innovation entities for national security purposes. **The overarching conclusion was that such organizations require clarity of mission, robust communication lines, top cover from leadership, and organic resources (funding) to improve their chances of success.**

- Innovation organizations should have a clear mission articulating their unique contribution (e.g., cross-cutting priorities) to enabling the rapid adoption of innovative commercial technologies and how they are differentiated from other entities. A clear mission statement is necessary, especially if there are multiple units and divisions within the parent organization that interact with industry on the adoption of technologies for mission capability.

Overlap in research objectives is sometimes desirable when different approaches are pursued simultaneously. But coordination of efforts and information sharing is a necessity. Enterprise innovation offices should prioritize coordination with existing (and what might be disparate) organic efforts and focus on answering cross-cutting needs in conjunction with the unique needs of sub-organizational units. Innovation entities might assist those elements in identifying potential emerging technologies that can serve their needs. But experts warn that not finding the appropriate lanes and proper coordination can lead to conflicts that will inhibit success.

- Government enterprise innovation units should be government-run, report directly to their respective agency's senior leadership, coordinate collaboration across multiple communities, and support ongoing enterprise efforts, especially those that enhance or enable cross-cutting capabilities (wherein multiple subordinate organizations benefit).



Adopting quasi-governmental or hybrid public-private models has also demonstrated effectiveness in accelerating the adoption of technology for mission capabilities. A Partnership Intermediary Agreement, as with ICWERX, and independent nonprofit organizations like In-Q-Tel (which receives government funding) are two examples.

- Enterprise innovation organizations should grow incrementally over a period of years while developing budget authorities substantial enough to capture the interest of companies that can provide mission-relevant technologies and capabilities.

Experts observed that existing innovation organizations required several years to mature. Budgets tend to be modest at first but grow over time, along with requisite authorities to engage with industry to facilitate the transition of technologies for mission capability.

- Measures of success also evolve over the years. Speed of engagement (time from first government contact with an industry provider to a contract or agreement) is a critical enabler.

Metrics of success in the early phases of enterprise innovation organizations often focus on the formation of the unit itself and the speed of contracting. These are reasonable goals. But demonstrating substantive enterprise-wide impact on operations takes time.



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