



SMALL BUSINESS RESEARCH PROGRAMS

Agencies Broadly Solicit Ideas, but Clearer Guidance Could Improve DOD Efforts

Report to Congressional Committees

September 2024
GAO-24-107036
United States Government Accountability Office

Accessible Version

GAO Highlights

View [GAO-24-107036](#). For more information, contact Hilary Benedict at (202) 512-6888 or BenedictH@gao.gov.
Highlights of [GAO-24-107036](#), a report to congressional committees

September 2024

SMALL BUSINESS RESEARCH PROGRAMS

Agencies Broadly Solicit Ideas, but Clearer Guidance Could Improve DOD Efforts

Why GAO Did This Study

To help drive economic growth, agencies provide SBIR and STTR awards to small businesses, which may face challenges funding research and development. For these awards, agencies release solicitations that include open or conventional topics.

The SBIR and STTR Extension Act of 2022 includes provisions for GAO to review agencies' use of open topics. This report examines, among other things, the extent to which agencies issued open topic awards in FY 2022 and the status of DOD's FY 2023 open topic efforts.

GAO analyzed data from participating agencies and the Small Business Administration (SBA) for awards issued from FY 2019 through 2022—the most recent data available at the time of GAO's review. To examine DOD's FY 2023 open topic efforts, GAO analyzed the 507 topics that DOD components released in their FY 2023 solicitations, including coding each topic on the extent to which the language specified research needs and solutions. GAO also reviewed statutory and policy requirements and interviewed agency officials.

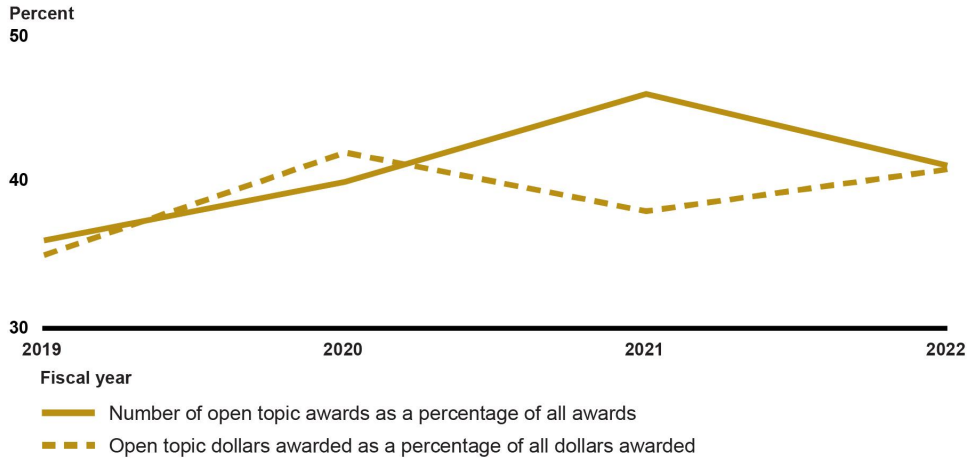
What GAO Recommends

GAO is making a recommendation to DOD to revise its open topic guidance to clarify how open and conventional topics should differ. DOD concurred with our recommendation.

What GAO Found

In fiscal year (FY) 2022, 40 percent of all Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) program awards, totaling about \$1.8 billion, were from open topics. In response to solicitations that include open topics, small businesses submit proposals that generally define research needs and propose solutions. GAO found that open topics may promote competition and increase innovation, because open topic awards were spread across a larger number of businesses compared to conventional topics. For conventional topics, agencies generally define needs, and small businesses propose solutions. Of the 11 agencies that participated in the SBIR and STTR programs in FY 2022, four exclusively issued open topic awards, four exclusively issued conventional topic awards, and the remaining three issued both types.

Open Topic Awards in the Small Business Innovation Research and Small Business Technology Transfer Programs, FY 2019–2022



Source: GAO analysis of data from the Small Business Administration and the 11 SBIR/STTR agencies. | GAO-24-107036

Each participating DOD component is required to release at least one open topic solicitation per year, starting in FY 2023. This requirement is intended, in part, to expand the ability for small businesses to propose solutions to meet DOD needs. In response, DOD issued guidance to its components, and the 12 relevant DOD components released FY 2023 topics that they identified as open.

However, some DOD components' open topics were similar to their conventional topics—narrowly defining needs and suggesting potential solutions. GAO found that seven of 12 components' FY 2023 open topics differed to some extent from their conventional topics in the specificity with which they defined needs and solutions, but the other five components' topics did not differ. DOD's guidance on open topics does not indicate whether and how open and conventional topics should differ. By clarifying its guidance to indicate how the topics' specificity should differ, DOD could ensure components consistently release open topics that are more broadly defined than their conventional topics. This would help DOD better fulfill the purposes of the act in implementing open topics activities and promote additional competition within the SBIR and STTR programs.

Contents

GAO Highlights	ii
Why GAO Did This Study	ii
What GAO Recommends	ii
What GAO Found	ii

Letter	1
Background	5
Agencies Used Open Topics to Fund About 40 Percent of FY 2022 Awards, Similar to the Average in Prior Years	9
Open Topics May Promote Competition, but Other Differences Between Topic Types Vary by Agency	15
DOD Released Solicitations with Open Topics, Which Varied in Specificity Across Components	22
Conclusions	31
Recommendation for Executive Action	32
Agency Comments	32

Appendix I	Objectives, Scope, and Methodology	34
Appendix II	Agency Timeliness in Notifying Businesses and Issuing Awards	39
Appendix III	GAO Contact and Staff Acknowledgments	41
	GAO Contact	41
	Staff Acknowledgments	41

Tables	
Table 1: Participating Agencies' Use of Open Topic Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022	10
Table 2: Participating Agencies' Award Types, Typical End Users, and Funding Mechanisms in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, as of FY 2022	12
Table 3: Open and Conventional Topic Awards Per Unique Business at Selected Agencies Participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022	16
Table 4: Selected Agencies' Applicant Success Rates for Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022	17
Table 5: Selected Agencies' Open and Conventional Topic Research Awards Made to Nontraditional Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022	18

Table 6: Selected Agencies' Open and Conventional Topic Research Awards Made to Socially and Economically Disadvantaged Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022 19

Table 7: Selected Agencies' Open and Conventional Topic Research Awards Made to Women-Owned Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, FY 2019–2022 19

Table 8: Selected Agencies' Open and Conventional Topic Research Awards Made to Veteran-Owned Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022 20

Table 9: Selected Agencies' Timeliness in Notifying Businesses of Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022 20

Table 10: Selected Agencies' Timeliness in Issuing Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022 21

Table 11: Commercialization Progress of Selected Agencies' Open and Conventional Topic Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs 21

Table 12: Proposals Received in DOD's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Component and Topic Type, FY 2023 25

Table 13: Dimensions and Codes to Assess the Narrowness and Broadness of DOD's FY 2023 Open and Conventional Topics 37

Table 14: Agencies' Timeliness in Notifying Businesses of Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022 39

Table 15: Agencies' Timeliness in Issuing Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022 39

Figures

Open Topic Awards in the Small Business Innovation Research and Small Business Technology Transfer Programs, FY 2019–2022 iii

Figure 1: Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs 3

Figure 2: Eleven Agencies Participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs 6

Figure 3: Phases of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs 8

Figure 4: Open Topic Awards by Year in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022 10

Figure 5: Selected Agencies' Open Topic Awards in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Year, FY 2019–2022 13

Figure 6: Selected Agencies' Open and Conventional Topic Award Amounts in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Phase, FY 2022 15

Figure 7: DOD Open and Conventional Topics in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program Solicitations, by Component, FY 2023 24

Figure 8: Variation in DOD Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2023 27

Figure 9: Variation in DOD Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Component, FY 2023 29

This is a work of the U.S. government and is not subject to copyright protection in the United States. The published product may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.

Abbreviations

DOD	Department of Defense
DOE	Department of Energy
FY	fiscal year
HHS	Department of Health and Human Services
R&D	research and development
SBA	Small Business Administration
SBIR	Small Business Innovation Research
STTR	Small Business Technology Transfer



September 30, 2024

Congressional Committees

Small businesses are important drivers of economic growth, but they can face challenges in accessing capital to fund research and development (R&D). Congress established the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs to enable small businesses to undertake and obtain the benefits of R&D.¹ The programs aim to

- stimulate technological innovation,
- meet federal R&D needs,
- foster diverse participation in innovation and entrepreneurship, and
- increase private-sector commercialization of innovations derived from federal R&D funding.²

Pursuant to the Small Business Act, federal agencies with an extramural research or R&D budget greater than \$100 million are required to participate in the SBIR program, and agencies with such obligations greater than \$1 billion are required to participate in the STTR program.³ According to the Small Business Administration (SBA), which oversees the programs, 11 federal agencies and their components participate in the SBIR program or in both the SBIR and STTR programs.⁴ In fiscal year (FY) 2022, participating agencies issued approximately \$4.4 billion in new SBIR and STTR awards, according to our analysis of SBA data. Agencies generally make SBIR and STTR awards in the form of grants, contracts, or cooperative agreements.⁵

¹The Small Business Innovation Development Act of 1982 established the SBIR program. Pub. L. No. 97-219, 96 Stat. 217. This act amended section 9 of the Small Business Act, Pub. L. No. 85-536, 72 Stat. 384 (1958), codified as amended at 15 U.S.C. § 638. The Small Business Technology Transfer Act of 1992 established the STTR program. Pub. L. No. 102-564, §§ 201-02, 106 Stat. 4249, 4256-61. This act made additional amendments to section 9 of the Small Business Act.

²The SBIR and STTR programs are similar in that participating agencies identify topics for R&D projects and make awards to qualified small businesses. The STTR program also requires the small business awardees to partner with a nonprofit research institution, such as a university or federally funded research and development center. Both programs are to be carried out in accordance with statutory and regulatory requirements and under oversight and guidance of the Small Business Administration. See 15 U.S.C. § 638.

³15 U.S.C. § 638(f)(1), (n)(1)(A). Agencies' R&D programs generally include funding for two types of R&D: intramural and extramural. Intramural R&D is conducted by employees of a federal agency in or through government-owned, government-operated facilities, or by contractors at government-owned, contractor-operated facilities. Extramural R&D is generally conducted by nonfederal employees outside of federal facilities. Federal agency, as defined under the statute, does not include agencies within the intelligence community. 15 U.S.C. § 638(e)(2).

⁴In this report, we refer to the agencies that issue SBIR and STTR awards as "participating agencies." Five agencies participated in STTR during the scope of our review, from fiscal years 2019 through 2022. In addition, the U.S. Department of Agriculture began participating in STTR in fiscal year 2023.

⁵Under the Federal Grant and Cooperative Agreement Act of 1977, grants and cooperative agreements are closely related but are distinguished by their expected degree of federal involvement. Under both funding mechanisms, the agency will transfer something of value, usually funds, to the recipient, to carry out a public purpose of support or stimulation authorized by federal law. Conversely, contracts are generally to be used when the principal purpose is to acquire property or services for the direct benefit or use by the U.S. government. 31 U.S.C. §§ 6303-6305. The Department of Defense also uses other transaction agreements for a limited number of awards, according to agency officials.

Participating agencies provide SBIR and STTR awards to small businesses to meet agency mission needs for R&D in different technology areas. In some instances, these mission needs focus on supporting R&D that would ultimately provide benefit beyond the agency, such as for the American public at large. In other instances, agencies' mission needs focus on advancing the development of technologies that would be used by the agencies themselves.

To meet these needs, the participating agencies solicit proposals from small businesses in one or more annual cycles. Solicitations include topics, which generally take two forms: open or conventional. Neither the authorizing legislation for the SBIR and STTR programs nor SBA's Policy Directive, which provides more specific direction for agencies in implementing these programs, defines open and conventional topics.⁶ Therefore, we developed definitions of these topic types in coordination with participating agencies for the purposes of our analysis and reporting.⁷ See figure 1 for explanations of open and conventional topics.

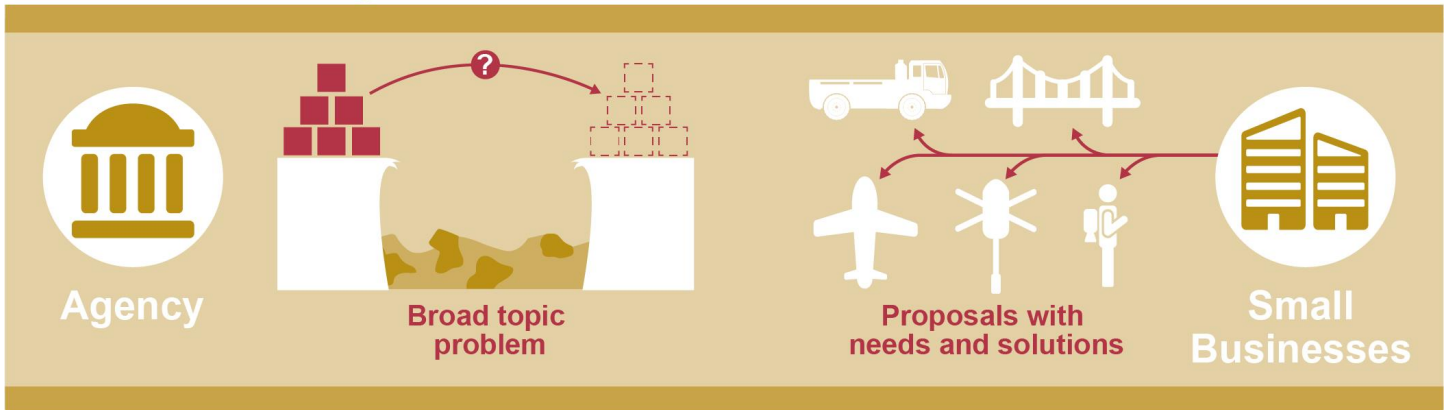
⁶15 U.S.C. § 638; SBA, *SBIR and STTR Policy Directive* (May 3, 2023).

⁷GAO, *Small Business Research Programs: Most Agencies Allow Applicants to Define Needs and Propose Solutions*, [GAO-23-106338](#) (Washington, D.C.: Sept. 29, 2023).

Figure 1: Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

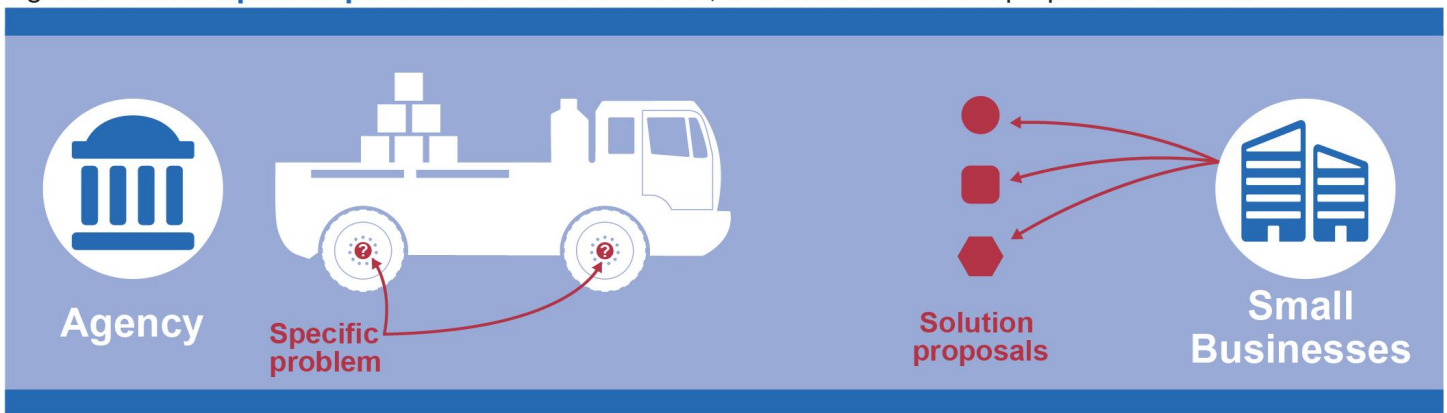
OPEN TOPIC

Agencies provide **broad topics**, and small businesses propose both potential **needs and solutions**



CONVENTIONAL TOPIC

Agencies define **specific problems** or mission needs, and small businesses propose **solutions**



Source: GAO analysis of information from the Small Business Administration and the 11 SBIR/STTR agencies; GAO (icons & illustration). | GAO-24-107036

The SBIR and STTR Extension Act of 2022 includes provisions for GAO to issue a series of reports comparing several aspects of open and conventional topics.⁸ The act also requires participating Department of Defense (DOD) components to release at least one open topic solicitation per fiscal year beginning with solicitations issued in FY 2023.⁹ DOD’s components are military departments, agencies, or offices. The act also includes a provision for GAO to report on DOD’s efforts to encourage and prepare new and diverse small businesses to respond to these solicitations. This is our second report on this issue. In our first report, issued in September 2023, we found that participating agencies funded about 40 percent of their SBIR and STTR awards from FY

⁸Pub. L. No. 117-183, § 7(b), 136 Stat. 2180, 2188-89.

⁹Codified at 15 U.S.C. § 638(ww). No other agencies are required by the act to use open topics. The statute refers to “announcements,” but we use the term solicitations.

2019 through 2021 using open topics.¹⁰ We also found that most DOD components had released open topics for FY 2023 by the time our report issued.

This second report in the series builds on our first report and examines (1) the extent to which participating agencies issued SBIR and STTR awards from open topics in FY 2022; (2) how participating agencies' FY 2022 open and conventional topic awards compare in terms of competition, participation of nontraditional small businesses, timeliness of awards, and commercialization of technologies—and factors that account for any differences; and (3) the status of DOD's open topics efforts and how DOD's FY 2023 open and conventional topics compare in terms of specificity.¹¹

For objectives 1 and 2, the scope of our work included SBA and the 11 participating agencies. To expand upon our prior analysis of participating agencies' awards from FY 2019 through 2021, we collected and analyzed agencies' award data for FY 2022 from SBA. We refer to these data as SBA award data for purposes of this report. We limited our review to FY 2022 data because FY 2022 was the most recent year with sufficiently reliable data available during our review. We also analyzed:

- SBA company registry data as of November 2023,
- General Services Administration System for Award Management registration data on veteran ownership for FY 2022, and
- SBA data on businesses' progression through different phases for which agencies provided awards from FY 2019 through 2022.¹²

We collected information from the 11 participating agencies, including data on their FY 2022 open and conventional topics. We assessed the reliability of the data and collected additional information from agencies, as necessary, to improve data reliability. After doing so, we found the data elements we used to describe differences between open and conventional topic awards to be sufficiently reliable.

For objective 3, to examine DOD's FY 2023 open topic efforts, we reviewed statutory requirements, DOD guidance, and other documentation; interviewed officials; and analyzed topics and proposal data for FY 2023. This included anonymizing and analyzing 507 DOD topics on the extent to which they defined a specific (1) DOD problem or need for proposals to address, (2) potential technology solution, and (3) technology stage. We then used this information to score each topic from most narrow (i.e., most specificity in defining needs and solutions) to most broad (i.e., least specificity in defining needs and solutions). We then compared the results of our analysis of topic specificity to criteria in statute and DOD guidance. We also analyzed DOD's topics to determine the extent to which they identified a specific potential end user.

¹⁰[GAO-23-106338](#).

¹¹The SBIR and STTR Extension Act of 2022 described "non-traditional small business concerns" as including those owned by "women, minorities, and veterans." Pub. L. No. 117-183, § 7(b), 136 Stat. 2180, 2189. For the purposes of this report, we refer to businesses as being owned by individuals from socially and economically disadvantaged groups rather than minority-owned, consistent with SBA's SBIR/STTR award data. Nontraditional small businesses may also include other groups, which are outside the scope of this analysis.

¹²Information on commercialization was limited, so our analysis focused on progression across two phases for which agencies provide awards under their SBIR/STTR programs—Phase I to Phase II.

We conducted this performance audit from August 2023 to September 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Participating Agencies

The 11 agencies that participate in the SBIR and STTR programs differ in how they implement their programs. Some of the agencies develop solicitation topics at the agency level, including determining whether topics will be open or conventional. Other agencies develop topics at the component level. At some agencies, certain components may develop solicitation topics and different components may have other key responsibilities, such as reviewing proposals or issuing awards. See figure 2 for a list of the 11 participating agencies and their components that developed topics during the scope of our review.

Figure 2: Eleven Agencies Participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

Components shown developed solicitation topics from fiscal years 2019 through 2022



Source: GAO analysis of agency information (data); 11 SBIR/STTR agencies (icons). | GAO-24-107036

Note: From fiscal years 2019 through 2022, all 11 agencies participated in SBIR, and five of those agencies participated in STTR (Department of Defense, Department of Energy, Department of Health and Human Services, National Aeronautics and Space Administration, and National Science Foundation).

^aThe National Geospatial-Intelligence Agency’s SBIR/STTR program is operated by the Office of the Secretary of Defense, according to an official with that office. We represented the National Geospatial-Intelligence Agency as a distinct component because the agency voluntarily participates in the SBIR/STTR programs.

Program Time Frames and Phases

SBA developed and periodically updates a policy directive to guide the general operation of agencies’ SBIR and STTR programs.¹³ According to SBA’s SBIR/STTR policy directive, each participating agency is to issue a

¹³SBA, *SBIR and STTR Policy Directive* (May 3, 2023). SBA issues policy directives for the general conduct of the SBIR and STTR programs per 15 U.S.C. § 638(j), (p).

solicitation requesting proposals that address certain topics, at least annually. Each participating agency is then to:

1. review the proposals it receives,
2. determine which small businesses should receive awards,
3. notify pending awardees within required time frames, and
4. issue awards within recommended time frames.

Under SBA's policy directive, most agencies must notify applicants of award decisions within 90 calendar days after a solicitation closes.¹⁴ The directive provides that most agencies should issue awards within 180 days after the solicitation closes.¹⁵




Participating agencies then issue awards for three phases of technology development (see fig. 3). Some agencies issue Direct-to-Phase-II SBIR awards to businesses that did not receive a Phase I award but completed equivalent work using non-SBIR/STTR funds.¹⁶

¹⁴The directive requires one agency and one agency component—the National Science Foundation and the Department of Health and Human Services' National Institutes of Health—to notify applicants no more than 1 year after the closing date of the solicitation. SBIR/STTR Policy Directive § 7(c)(1).

¹⁵SBA provides that the National Science Foundation and National Institutes of Health should issue awards no more than 15 months after the closing date. SBIR/STTR Policy Directive § 7(c)(1).

¹⁶DOD, the National Institutes of Health, and the Department of Education are authorized to issue Direct-to-Phase-II SBIR awards through FY 2025, following a determination by the agency head that the small business has determined the scientific and technical merit and feasibility of the project. 15 U.S.C. § 638(cc).

Figure 3: Phases of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

	 Phase I: Feasibility	 Phase II: Technology Advancement	 Phase III: Commercialization
Purpose	To determine technical merit and feasibility	To make technical progress, such as developing prototypes	To complete development and sell products
Competition	Businesses compete for awards in response to agency solicitations	Phase I awardees with projects that demonstrate scientific and technical merit compete for Phase II awards ^a	Agencies may issue Phase III awards without further competition ^b
Award amount^c	Up to \$306,872	Up to \$2,045,816	No limit
Funding source^d	Participating agencies' SBIR/STTR budgets	Participating agencies' SBIR/STTR budgets	Non-SBIR/STTR sources ^b
Duration^e	6 months for SBIR and 12 months for STTR	24 months	No limit

Source: GAO analysis of information from the Small Business Administration (SBA) (data); Vector Mine/stock.adobe.com (images). | GAO-24-107036

^aThe Department of Defense, Department of Education, and National Institutes of Health are authorized to issue Direct-to-Phase-II SBIR awards through fiscal year 2025 to businesses that did not receive a Phase I award but completed equivalent work using non-SBIR/STTR funds, following a determination by the agency head that the small business has determined the scientific and technical merit and feasibility of the project. 15 U.S.C. § 638(cc).

^bPhase III funding can also come from non-federal sources of capital, and Phase III awards funded with federal non-SBIR funding can also be used for the continuation of research or R&D that has been competitively selected using peer review or merit-based selection procedures. 15 U.S.C. § 638(e)(4)(C), (e)(6)(C).

^cAuthorized award amounts are as of October 2023. Maximum award amounts include any modifications to the original award amount. Agencies may seek a waiver from SBA to issue awards above the maximum values.

^dSBIR/STTR budget refers to the portion of an agency's extramural research or R&D budget designated for the SBIR/STTR programs.

^eAgencies may provide longer performance periods where appropriate for particular projects.

Competition for Open and Conventional Topic Awards

In September 2023, we found that most participating agencies issue solicitations that include at least some open topics.¹⁷ According to agency officials we interviewed for that report, agencies consider their goals when deciding whether to use open or conventional topics. For example, agencies reported using open topics when aiming to increase the number and quality of proposals received. We analyzed data on awards from FY 2019

¹⁷GAO-23-106338.

through 2021 and found that businesses receiving conventional topic awards tended to receive multiple awards. This could indicate that open topics promote competition, because a smaller number of open topic awards were spread across a larger number of businesses, compared to conventional topics.

In addition, in March 2024, we issued a report that discussed the 22 small businesses that received the greatest number of SBIR/STTR awards over a 10-year period—known as “multiple awardees.”¹⁸ We found that the three agencies with the highest percentages of awards to multiple awardees have issued all or most awards from conventional topics in recent years. In contrast, the four agencies that issued the lowest percentages of awards to multiple awardees primarily issued open topic awards.

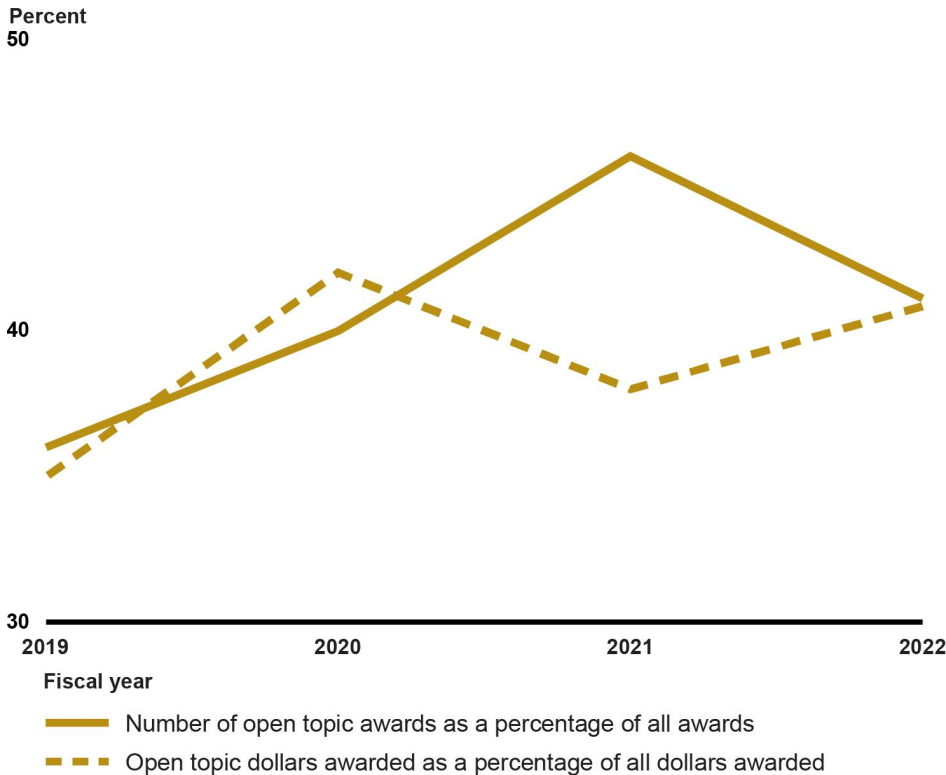
Agencies Used Open Topics to Fund About 40 Percent of FY 2022 Awards, Similar to the Average in Prior Years

Based on our analysis of participating agency and SBA data, we found that agencies used open topics to fund about 40 percent of all SBIR/STTR awards in FY 2022—similar to our findings on their average use of open topics from FY 2019 through 2021 (see fig. 4).¹⁹ This amounted to approximately \$1.8 billion in open topic awards in FY 2022.

¹⁸GAO, *Small Business Research Programs: Increased Performance Standards Likely Affect Few Businesses Receiving Multiple Awards*, [GAO-24-106398](#) (Washington, D.C.: March 29, 2024).

¹⁹Overall from FY 2019 through 2021, participating agencies used open topics to fund approximately 41 percent of all SBIR/STTR awards.

Figure 4: Open Topic Awards by Year in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022



Source: GAO analysis of data from the Small Business Administration and the 11 SBIR/STTR agencies. | GAO-24-107036

Note: Information includes SBIR and STTR awards.

In FY 2022, four participating agencies exclusively issued open topic awards, four exclusively issued conventional topic awards, and the remaining three issued both open and conventional topic awards (see table 1).

Table 1: Participating Agencies’ Use of Open Topic Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022

Agency	Number of awards: Open topic awards	Number of awards: All SBIR/STTR awards	Number of awards: Percentage	Dollars awarded: Open topic dollars awarded (in millions)	Dollars awarded: All SBIR/STTR dollars awarded (in millions)	Dollars awarded: Percentage
Department of Commerce	58	58	100%	\$16.6	\$16.6	100%
Department of Education	21	21	100%	\$12.0	\$12.0	100%
National Science Foundation	446	446	100%	\$202.0	\$202.0	100%
U.S. Department of Agriculture	112	112	100%	\$34.4	\$34.4	100%

Agency	Number of awards: Open topic awards	Number of awards: All SBIR/STTR awards	Number of awards: Percentage	Dollars awarded: Open topic dollars awarded (in millions)	Dollars awarded: All SBIR/STTR dollars awarded (in millions)	Dollars awarded: Percentage
Department of Health and Human Services	936	1,363	69%	\$804.2	\$1,208.3	67%
Department of Defense	992	3,185	31%	\$716.1	\$2,344.1	31%
Department of Energy ^a	53	660	8%	\$22.8	\$359.9	6%
Department of Homeland Security	0	44	0%	\$0	\$18.2	0%
Department of Transportation	0	29	0%	\$0	\$13.4	0%
Environmental Protection Agency	0	40	0%	\$0	\$6.9	0%
National Aeronautics and Space Administration	0	482	0%	\$0	\$190.1	0%
Total	2,618	6,440	41%	\$1,808.1	\$4,406.0	41%

Source: GAO analysis of data from the Small Business Administration and the 11 SBIR/STTR agencies. | GAO-24-107036

Note: Information includes SBIR and STTR awards. All 11 agencies participated in SBIR, and five of the agencies participated in STTR. Award amounts are rounded to the nearest \$100,000. Percentages are rounded to the nearest 1 percent. FY = fiscal year.

^aSome Department of Energy open topic awards originated from solicitation topics that included both open and conventional subtopics.

Most agencies continued their prior practices of issuing only open topic awards, only conventional topic awards, or a mix of both. Exceptions occurred at the Departments of Commerce and Education. Both had issued a mix of open and conventional topic awards during some or all of the period from FY 2019 through 2021. Commerce issued a mix of open and conventional topics in FY 2019 through 2021 and completed a transition to sole use of open topics in FY 2022. Commerce officials said that they have shifted to using open topics because open topics resulted in more innovative proposals, in part because of increased competition among applicants. Education, which transitioned from issuing a mix of open and conventional topic awards from FY 2019 through 2020, and issued only open topic awards in FY 2021, continued to rely solely on open topics in FY 2022.

As we previously found, agencies use different funding mechanisms (contracts, grants, cooperative agreements, or other transaction agreements) to fund a range of technologies (e.g., artificial intelligence or semiconductors) that have varying end users. For example, the four agencies that issued exclusively open topic awards in FY 2022 funded technologies intended for end users external to the agency. External end users may include other federal agencies, other public entities, or consumers. See table 2 for more information on topic types, end users, and funding mechanisms as of FY 2022.

Table 2: Participating Agencies’ Award Types, Typical End Users, and Funding Mechanisms in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, as of FY 2022

Category	Agency	Typical end user: Participating agency	Typical end user: Users outside participating agency	Grants	Funding mechanism: Cooperative agreements	Funding mechanism: Contracts	Other transaction agreements
All open topic awards in FY 2022	National Science Foundation	no	yes	yes	yes	no	no
All open topic awards in FY 2022	U.S. Department of Agriculture	no	yes	yes	no	no	no
All open topic awards in FY 2022	Department of Commerce	no	yes	yes	yes	no	no
All open topic awards in FY 2022	Department of Education	no	yes	no	no	yes	no
All conventional topic awards in FY 2022	Department of Homeland Security	yes	no	no	no	yes	no
All conventional topic awards in FY 2022	Department of Transportation	no	yes	no	no	yes	no
All conventional topic awards in FY 2022	Environmental Protection Agency	no	yes	no	no	yes	no
All conventional topic awards in FY 2022	National Aeronautics and Space Administration	yes	no	no	no	yes	no
Both open and conventional topic awards in FY 2022	Department of Defense	yes	no	no	no	yes	yes
Both open and conventional topic awards in FY 2022	Department of Energy ^a	no	yes	yes	yes	no	no
Both open and conventional topic awards in FY 2022	Department of Health and Human Services	no	yes	yes	yes	yes	no

√ = yes; — = no

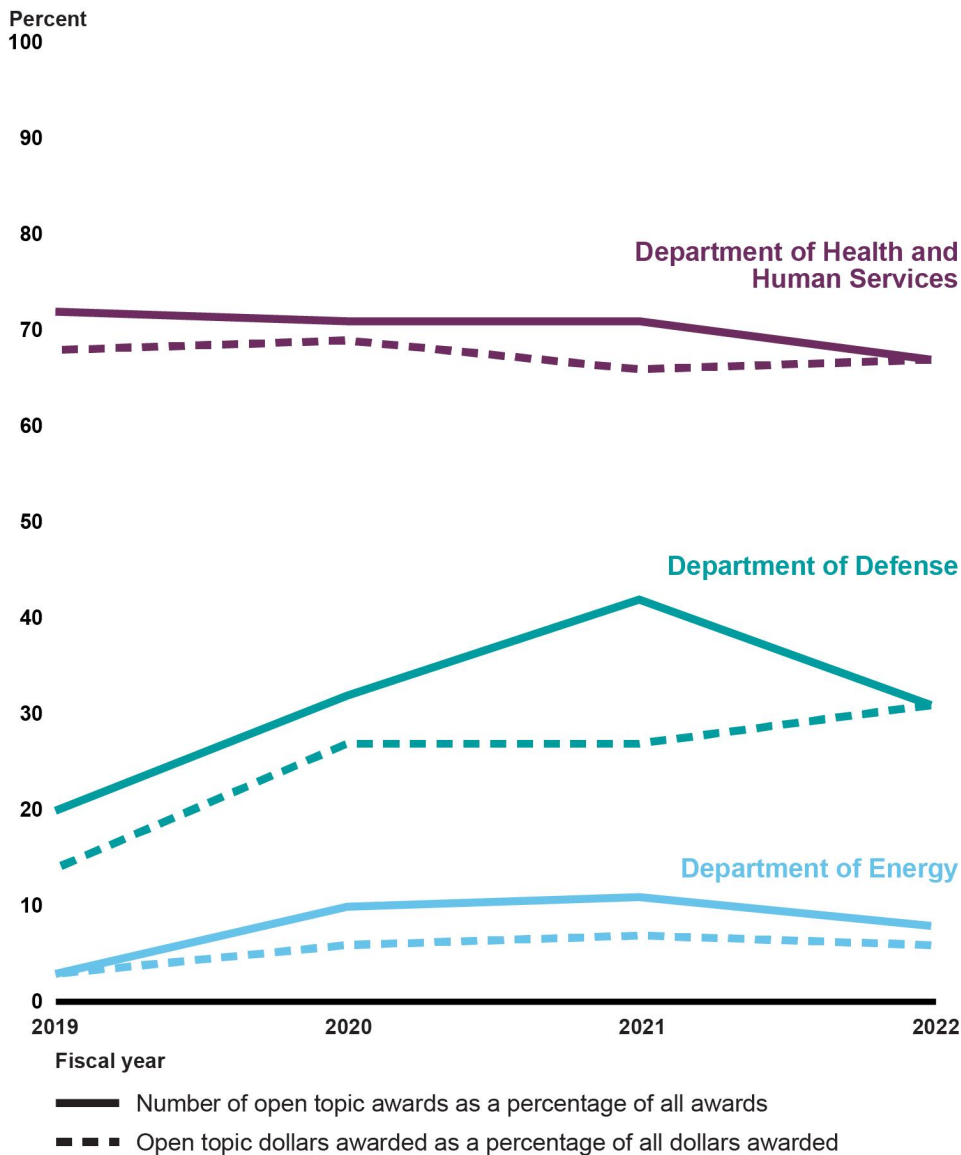
Source: GAO analysis of data from the 11 SBIR/STTR agencies. | GAO-24-107036

Note: Information includes SBIR and STTR awards. All 11 agencies participated in SBIR, and five of the agencies participated in STTR. FY = fiscal year.

^aSome Department of Energy open topic awards originated from solicitation topics that included both open and conventional subtopics.

The three agencies that issued both open and conventional topic awards in FY 2022 differed over time in the proportion of total awards that were issued from open topics (see fig. 5).

Figure 5: Selected Agencies' Open Topic Awards in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Year, FY 2019–2022



Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022.

The three agencies that issued both open and conventional topic awards in FY 2022 issued larger awards for conventional topics in most cases (see fig. 6):

- At DOD, the median conventional topic award was over 3 times the dollar amount of the median open topic award for Phase I. The Air Force primarily contributed to this difference because it issued almost all of DOD’s open topic awards. The Air Force’s median Phase I award was almost \$50,000 for open topics and

almost \$150,000 for conventional topics. We previously found that the Air Force intentionally issues Phase I open topic awards with a shorter period of performance and smaller award amount, when compared to its conventional topic awards.²⁰ According to a report co-written by a DOD official formerly with the Air Force, Air Force open topic awards are smaller than its conventional awards because having a larger number of smaller awards can help spur small businesses to patent their technologies and seek venture capital funding to support further development.²¹

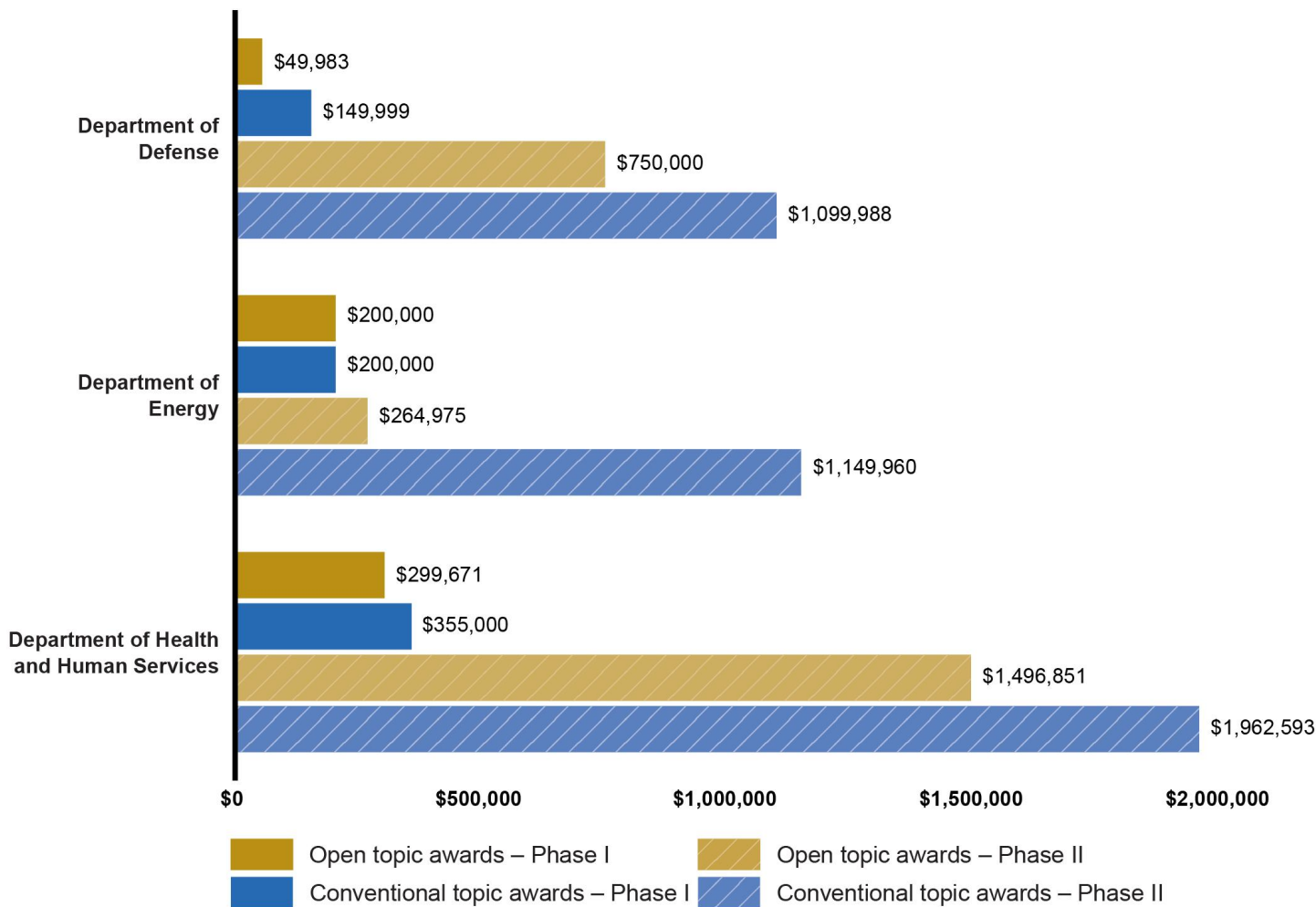
- At the Department of Energy (DOE), the median conventional topic award was over 4 times the amount of the median open topic award for Phase II. The Advanced Research Projects Agency-Energy primarily contributed to this difference. Its median Phase II award was over \$250,000 for open topics and over \$1,537,000 for conventional topics.
- At the Department of Health and Human Services (HHS), conventional topic awards were also larger than open topic awards but to a lesser degree. For example, Phase I conventional topic awards were about 20 percent larger than Phase I open topic awards.

²⁰GAO, *Small Business Research Programs: Air Force Had Success in Some Areas with New Awards Process*, [GAO-22-105223](#) (Washington, D.C.: July 21, 2022).

²¹Sabrina T. Howell, Jason Rathje, John Van Reenen, and Jun Wong, *Opening Up Military Innovation: Causal Effects of Reforms to U.S. Defense Research*, National Bureau of Economic Research (NBER) Working Paper No. 28700 (published Apr. 2021; updated March 2023).

Figure 6: Selected Agencies' Open and Conventional Topic Award Amounts in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Phase, FY 2022

Median dollar amounts of Phase I and II awards issued



Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022.

Open Topics May Promote Competition, but Other Differences Between Topic Types Vary by Agency

Including open topics in solicitations may promote competition. However, we found that other differences associated with topic type varied across the three agencies that issued both open and conventional topic awards—DOD, DOE, and HHS. We focused our analysis on these three agencies so that we could compare awards from different topic types within the same agency. Based on our analysis of several indicators of competition, such as lower market concentration, we found that open topics may better promote competition as compared to conventional topics. However, our analyses indicated that differences between topic type vary by

agency on nontraditional small business participation, award timeliness, and progress toward commercialization.

Open Topics May Better Promote Competition Compared to Conventional Topics

We found that including open topics in solicitations may promote competition, based on our analysis of several competition indicators. For example, our analysis of FY 2022 SBA award data for all 11 participating agencies found that, when compared to conventional topics, open topics had a lower market concentration, which is one indicator of competition. Specifically, in FY 2022, agencies awarded a smaller number of open topic awards to a larger number of small businesses compared to conventional topics—2,092 unique small businesses received 2,618 open topic awards. This represented an average of about 1.3 awards and \$864,281 per business. The 10 businesses that received the most open topic awards received approximately 3 percent of all open topic awards. In contrast, in FY 2022, 1,966 unique small businesses received 3,822 conventional topic awards (an average of about 1.9 awards and \$1,321,406 per business). The 10 businesses that received the most conventional topic awards received approximately 10 percent of all conventional topic awards.

These findings on market concentration can also be seen at two of the three agencies that issued both open and conventional topic awards in FY 2022 (DOD and DOE; see table 3). DOD had the largest difference between open and conventional topic awards. For HHS, the number of open topic awards was slightly higher than the number of conventional topic awards per unique business.

Table 3: Open and Conventional Topic Awards Per Unique Business at Selected Agencies Participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022

Agency	Number of awards per unique business: Open topic awards	Number of awards per unique business: Conventional topic awards	Dollars awarded per unique business: Open topic awards	Dollars awarded per unique business: Conventional topic awards
Department of Defense	1.4	2.2	\$987,690	\$1,602,424
Department of Energy	1.3	1.5	\$570,256	\$832,367
Department of Health and Human Services	1.2	1.1	\$1,028,385	\$1,049,639

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. Number of awards per business is rounded to the nearest tenth. Dollars awarded per business are rounded to the nearest dollar.

Based on data from the three agencies that used both topic types, we found that open topics had lower applicant success rates compared to conventional topics (see table 4). A lower applicant success rate—the percentage of proposals that resulted in an award—is another indicator of higher competition. In our prior report on open topics, officials from some agencies told us they were more likely to use conventional topics to maintain a high applicant success rate, whereas officials from other agencies said they use open topics to promote competition.²² However, several factors could influence applicant success rates, such as the number of proposals received and agency prioritization of more specific versus more general R&D needs. For example, officials from DOD and DOE said that proposals submitted under open topics may not always align with the agency’s R&D priorities, which can result in a lower applicant success rate of open topic proposals.

²²GAO-23-106338.

Table 4: Selected Agencies' Applicant Success Rates for Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022

Agency	Open topics: Number of proposals	Open topics: Number of awards	Open topics: Success rate	Conventional topics: Number of proposals	Conventional topics: Number of awards	Conventional topics: Success rate
Department of Defense	3,335	992	30%	6,884	2,193	32%
Department of Energy	217	53	24%	1,979	607	31%
Department of Health and Human Services	5,638	936	17%	1,470	427	29%

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. Percentages are rounded to the nearest 1 percent.

Further, officials from DOD, DOE, and one HHS component that issues both open and conventional topic awards (the National Institutes of Health) stated that open topics attracted a higher number of first-time awardees to their agencies in FY 2022, compared to conventional topics.²³ New businesses receiving awards is another indicator of competition.

In FY 2022, information about first-time applicants was available from two of the three agencies that issued both open and conventional topic awards—DOD and DOE. According to officials, differences in first-time applicants between open and conventional topics varied across the two agencies. At DOD, conventional topics attracted a higher number of first-time applicants, whereas at DOE, open topics attracted a higher number of first-time applicants. Officials from the National Institutes of Health said that data on first-time applicants were not readily available for FY 2022.

Other Differences Between Open and Conventional Topics Vary by Agency

Nontraditional Small Business Participation

The three agencies that issued both open and conventional topic awards in FY 2022—DOD, DOE, and HHS—varied in the percentages of awards that they issued to nontraditional small businesses (see table 5). We analyzed data on three types of nontraditional small businesses: socially and economically disadvantaged,

²³Agencies participating in the SBIR/STTR programs are not required to track first-time applicants and awardees, but at least some components under each of the three agencies collected data on first-time applicants and awardees in FY 2022.

women-owned, and veteran-owned.²⁴ Some agencies' rates for open topic awards to nontraditional small businesses increased while others decreased, as compared to FY 2019 through 2021. All three agencies' rates for awards to nontraditional small businesses increased for conventional topics.

Table 5: Selected Agencies' Open and Conventional Topic Research Awards Made to Nontraditional Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022

Percentage of awards to nontraditional small businesses

Agency	Open topic awards: 2019–2021	Open topic awards: 2022	Conventional topic awards: 2019–2021	Conventional topic awards: 2022
Department of Defense	25%	25%	20%	21%
Department of Energy	17%	8%	15%	19%
Department of Health and Human Services	22%	29%	26%	31%

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. For the purposes of this table, nontraditional small businesses are owned by women, people from socially and economically disadvantaged groups, or veterans. Awards with missing data on nontraditional small businesses are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent.

DOD, DOE, and HHS also varied in the percentages of awards that they issued to specific types of nontraditional small businesses:

- Socially and economically disadvantaged.** DOE and HHS issued a higher percentage of conventional topic awards, as opposed to open topic awards, to socially and economically disadvantaged small businesses in FY 2022 (see table 6). DOD's data showed no difference between topic type. Comparing the percentage of awards to socially and economically disadvantaged businesses for open topic awards in FY 2019 through 2021 to FY 2022, DOE's percentages decreased, DOD's stayed the same, and HHS's increased. All three agencies' rates of awards for socially and economically disadvantaged businesses increased for conventional topic awards, consistent with their rate of awards made to nontraditional small businesses overall.

²⁴Categories of nontraditional small businesses are not mutually exclusive. For example, a business could be both women- and veteran-owned. According to the Small Business Act, socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias due to their identity as a member of a group, and such groups include Black Americans, Hispanic Americans, Indian tribes, Asian Pacific Americans, Native Hawaiian organizations, and other minorities. 15 U.S.C. §§ 637(a)(5), 631(f)(1). Economically disadvantaged individuals are socially disadvantaged individuals "whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged." 15 U.S.C. § 637(a)(6). Socially and economically disadvantaged small businesses are those that are at least 51 percent owned by, and whose management and daily business operations are controlled by, socially and economically disadvantaged individuals, economically disadvantaged Indian tribes, or economically disadvantaged Native Hawaiian organizations. 15 U.S.C. § 637(a)(4). A business is considered small if it is independently owned and operated, is not dominant in its field of operations, and meets any definitions or standards established by the SBA administrator. 15 U.S.C. § 632(a).

Table 6: Selected Agencies' Open and Conventional Topic Research Awards Made to Socially and Economically Disadvantaged Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022

Percentage of awards to socially and economically disadvantaged small businesses

Agency	Open topic awards: 2019–2021	Open topic awards: 2022	Conventional topic awards: 2019–2021	Conventional topic awards: 2022
Department of Defense	8%	8%	6%	8%
Department of Energy	9%	3%	8%	11%
Department of Health and Human Services	13%	17%	15%	20%

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. Awards with missing data on socially and economically disadvantaged small businesses are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent.

- **Women-owned.** Percentages of awards to women-owned businesses varied by topic type and agency, similar to our findings in prior years (see table 7).

Table 7: Selected Agencies' Open and Conventional Topic Research Awards Made to Women-Owned Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, FY 2019–2022

Percentage of awards to women-owned small businesses

Agency	Open topic awards: 2019–2021	Open topic awards: 2022	Conventional topic awards: 2019–2021	Conventional topic awards: 2022
Department of Defense	9%	8%	10%	9%
Department of Energy	8%	6%	8%	10%
Department of Health and Human Services	10%	16%	14%	14%

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. Awards with missing data on women-owned small businesses are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent.

- **Veteran-owned.** The low number of awards to veteran-owned small businesses in FY 2022 makes meaningful comparison between topic types difficult (see table 8). DOD maintained consistent percentages in both open and conventional topic awards to veteran-owned small businesses in FY 2019 through 2021 and FY 2022, awarding a higher percentage of awards to veteran-owned businesses compared to the other agencies. Rates decreased at DOE for both open topic awards and conventional topic awards, and HHS had a slight decrease in open topic awards and increase in conventional topic awards when compared to prior years.

Table 8: Selected Agencies’ Open and Conventional Topic Research Awards Made to Veteran-Owned Small Businesses in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022

Percentage of awards to veteran-owned small businesses

Agency	Open topic awards: 2019–2021	Open topic awards: 2022	Conventional topic awards: 2019–2021	Conventional topic awards: 2022
Department of Defense	12%	12%	6%	6%
Department of Energy	1%	0%	2%	1%
Department of Health and Human Services	2%	1%	1%	2%

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. Percentages are rounded to the nearest 1 percent or first significant digit.

Timeliness to Notify Small Businesses and Issue Awards

The extent to which agencies met recommended and required time frames for notifying applicants and issuing awards—known as timeliness—varied in FY 2022. Notification time is the number of days between the date a solicitation closed (or, in some cases, when the agency received a proposal) and the date the agency notified the business that it was selected for an award. Issuance time is the number of days between the date a solicitation closed (or the agency received a proposal) and the date the agency issued the award to the business. Across all 11 agencies, notification timeliness was generally higher for conventional topic awards, compared to open topic awards. Issuance timeliness was generally similar for open and conventional topic awards. For information on timeliness at all 11 participating agencies, see appendix II.

Notification and issuance timeliness also varied across the three agencies that issued both open and conventional topic awards in FY 2022. As a result, it is difficult to determine whether agencies’ use of open or conventional topics promotes timeliness, even when limiting the analysis to those agencies that used both topic types.

Notification. DOD, DOE, and HHS notification timeliness in FY 2022 was higher for conventional topic awards, compared to open topic awards (see table 9). Differences by topic type were greatest at DOD (18 percentage points) and DOE (13 percentage points) in FY 2022. Some agencies’ rates increased while others decreased for both topic types, as compared to FY 2019 through 2021. Factors such as the number of proposals received and the number of available reviewers with expertise in specific technology areas can affect timeliness, according to agency officials.

Table 9: Selected Agencies’ Timeliness in Notifying Businesses of Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022

Percentage of open and conventional topic awards with on-time notifications

Agency	Open topic awards: 2019–2021	Open topic awards: 2022	Conventional topic awards: 2019–2021	Conventional topic awards: 2022
Department of Defense	79%	66%	82%	84%
Department of Energy	85%	86%	100%	99%
Department of Health and Human Services	97%	93%	95%	99%

Source: GAO analysis of data from the Small Business Administration (SBA) and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. SBA's policy directive requires these agencies to notify businesses within 90 calendar days after a solicitation closes, except the National Institutes of Health within HHS, which has 1 year to notify businesses. Awards with missing data on notification timeliness are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent.

Issuance. Issuance timeliness varied by agency and topic type in FY 2022 (see table 10). Differences by topic type were greatest at DOD, where DOD met timeliness goals for open topic awards more frequently than for conventional topic awards. Again, some agencies' rates increased while others decreased for open and conventional topic awards, as compared to prior years. Factors other than the topic type (open or conventional), such as funding mechanisms used (e.g., grants, cooperative agreements), can also affect issuance timeliness, according to DOE officials.

Table 10: Selected Agencies' Timeliness in Issuing Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2019–2022

Percentage of open and conventional topic awards with on-time issuance

Agency	Open topic awards: 2019–2021	Open topic awards: 2022	Conventional topic awards: 2019–2021	Conventional topic awards: 2022
Department of Defense	93%	80%	60%	62%
Department of Energy	82%	100%	96%	99%
Department of Health and Human Services	96%	88%	94%	88%

Source: GAO analysis of data from the Small Business Administration (SBA) and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. SBA's policy directive provides that these agencies should issue an award within 180 calendar days after a solicitation closes, except the National Institutes of Health within HHS, which has 15 months. Awards with missing data on issuance timeliness are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent.

Commercialization of Technologies Funded

Businesses that received DOD, DOE, and HHS awards demonstrated varying success in progressing toward commercialization, depending on agency. Specifically, we analyzed SBA data to determine the extent to which FY 2019 Phase I open and conventional topic awards progressed to Phase II at any time from FY 2020 through FY 2022 (see table 11). All three agencies had similar rates of progression across the two topic types.

Table 11: Commercialization Progress of Selected Agencies' Open and Conventional Topic Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

FY 2019 Phase I awards progressing to Phase II in FY 2020–2022

Agency	Open topic awards: Number	Open topic awards: Percentage	Conventional topic awards: Number	Conventional topic awards: Percentage
Department of Defense	226	42%	687	41%
Department of Energy	5	42%	163	40%
Department of Health and Human Services	241	29%	87	27%

Source: GAO analysis of data from the Small Business Administration and selected agencies. | GAO-24-107036

Note: Selected agencies are those that issued both open and conventional topic awards through SBIR or STTR in fiscal year (FY) 2022. Percentages are rounded to the nearest 1 percent.

As in our prior report, we found that data on progression to Phase III—known as the commercialization phase—are limited and not sufficiently reliable to understand whether open or conventional topics lead to a

greater likelihood of commercialization.²⁵ The SBIR/STTR programs do not fund Phase III awards, and there are limited requirements for small businesses to report commercialization metrics beyond the award term.²⁶ The Federal Procurement Data System includes a field to identify Phase III contracts resulting from Phase I or Phase II SBIR/STTR awards, but the field is optional. Further, the database does not include awards funded with grants or cooperative agreements.

According to several National Academies reports, finding links between federally funded R&D and any commercialization outcome is difficult.²⁷ There are typically long gaps in time between research and the eventual effect the research creates. And certain outcomes may be unobservable or difficult to measure, such as acquisitions, creation of spin-off businesses by principal investigators, and knowledge spillover. However, a 2021 working paper found that open topic awards were effective at increasing small businesses' subsequent venture capital funding and patents.²⁸ According to the paper, conventional topic awards had no statistically significant effects on these outcomes.

DOD Released Solicitations with Open Topics, Which Varied in Specificity Across Components

Based on our analysis of FY 2023 solicitations, we found that DOD released open topic solicitations as required by statute and DOD guidance. However, the specificity of these open topics varied across DOD components. Some open topics narrowly defined needs and potential solutions, which could limit DOD's ability to implement innovation open topics activities in a way that fulfills the purposes of the SBIR and STTR Extension Act of 2022.

DOD Components Released Open Topics as Required

All relevant DOD components released at least one open topic solicitation in FY 2023, in compliance with the SBIR and STTR Extension Act of 2022. The components varied in their efforts to promote these open topics to small businesses.

Number of Topics Released and Proposals Received

In FY 2023, all relevant DOD components (12 of 13) released at least one open topic solicitation, in compliance with Section 7(a) of the SBIR and STTR Extension Act of 2022 (the Program on Innovation Open

²⁵[GAO-23-106338](#).

²⁶Small businesses that receive more than 15 Phase II awards in the prior 5 fiscal years are required to report commercialization metrics.

²⁷National Academies of Sciences, Engineering, and Medicine, *Review of the SBIR and STTR Programs at the National Science Foundation* (Washington, D.C.: The National Academies Press, 2023); *Assessment of the SBIR and STTR Programs at the National Institutes of Health* (Washington, D.C.: The National Academies Press, 2022); and *Review of the SBIR and STTR Programs at the Department of Energy* (Washington, D.C.: The National Academies Press, 2020).

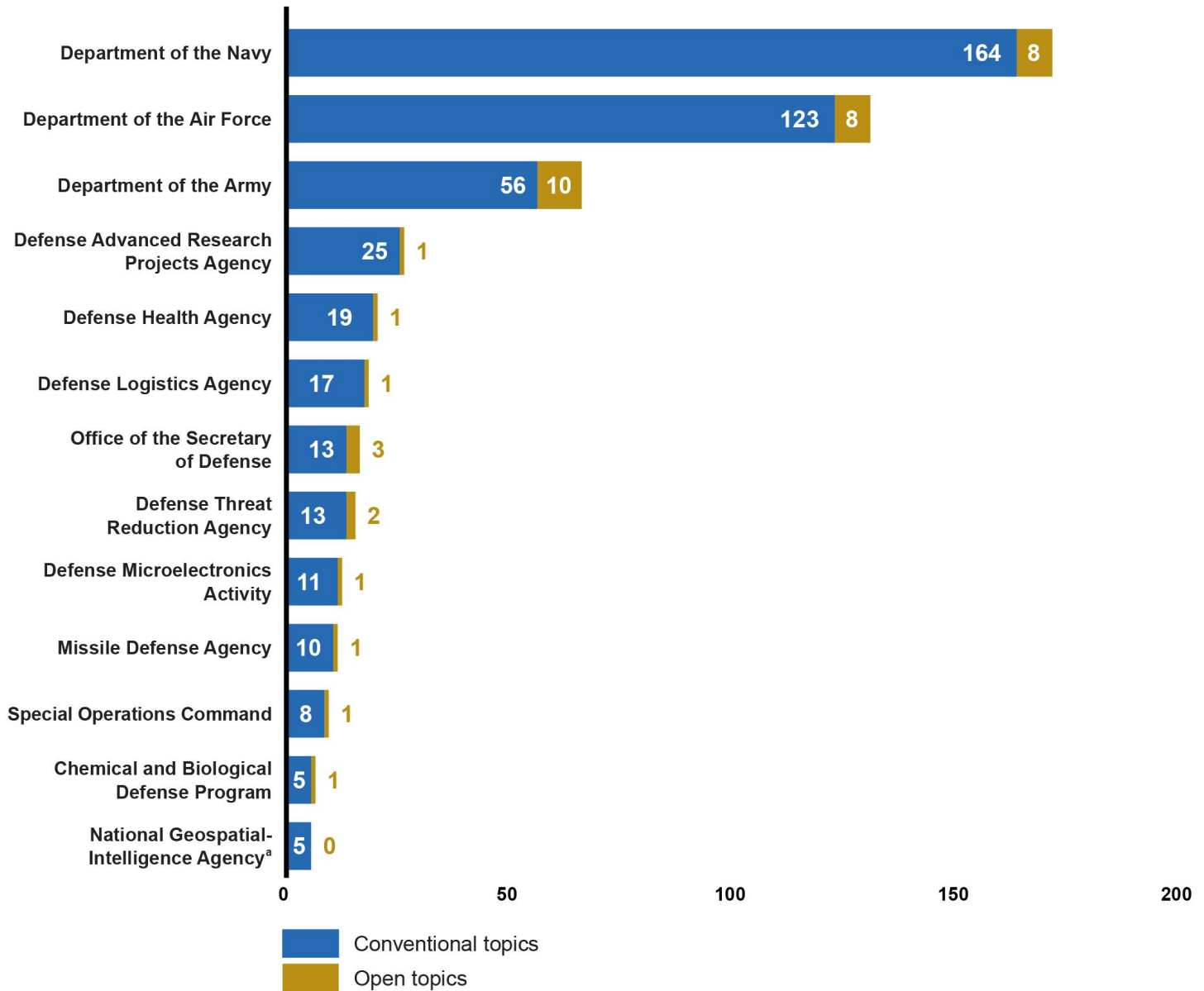
²⁸Howell et al., *Opening Up Military Innovation: Causal Effects of Reforms to U.S. Defense Research*. These findings were statistically significant, within a 95-percent confidence interval. The study's authors used an econometric model to estimate causal effects of award receipt on commercialization.

Topics).²⁹ In addition, the components generally identified open topics in the topic title (9 of 12) and number (12 of 12)—as directed in DOD guidance. This guidance, effective since March 2023, outlines how components should release open topic solicitations and evaluate the resulting proposals.

DOD released 507 total topics in FY 2023 solicitations, including 38 open topics. The number of open topics varied by component (see fig. 7).

²⁹Pub. L. No. 117-183, § 7, 136 Stat. 2180, 2188 (codified at 15 U.S.C. § 638(w)). One component, the National Geospatial-Intelligence Agency, is not required to participate in the SBIR/STTR programs and thus is exempt from the requirement for DOD components to issue solicitations with at least one open topic per fiscal year. See 15 U.S.C. § 638(e)(2).

Figure 7: DOD Open and Conventional Topics in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program Solicitations, by Component, FY 2023



Source: GAO analysis of information from the Department of Defense (DOD). | GAO-24-107036

Note: Information includes topics released in solicitations for both SBIR and STTR.

^aThe National Geospatial-Intelligence Agency is not required to participate in the SBIR/STTR programs and thus is exempt from the requirement for DOD components to issue solicitations with at least one open topic per fiscal year. 15 U.S.C. § 638(e)(2).

DOD received more proposals for open topics than for conventional topics overall. The number of proposals received varied by component (see table 12). Among components, the Air Force received the highest number of proposals overall, as well as the highest number of proposals from open topics. Air Force officials said that three factors may have contributed to the Air Force receiving a higher number of proposals than other components. First, small businesses may feel that they have a better chance applying for Air Force open topic

awards because of the Air Force’s programmatic resources and infrastructure. Second, the Air Force has broad technology development needs, because it also includes the Space Force in its SBIR/STTR programs. Third, the Air Force uses multiple outreach approaches to promote opportunities for small businesses.

Table 12: Proposals Received in DOD’s Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Component and Topic Type, FY 2023

Component	Number of proposals received: Open topics	Number of proposals received: Conventional topics
Chemical and Biological Defense program	17	87
Defense Advanced Research Projects Agency	129	245
Defense Health Agency	5	329
Defense Logistics Agency	19	318
Defense Microelectronics Activity	18	84
Defense Threat Reduction Agency	30	115
Department of the Air Force	5,985	1,840
Department of the Army	961	1,354
Department of the Navy	517	2,710
Missile Defense Agency	30	133
National Geospatial-Intelligence Agency ^a	N/A	94
Office of the Secretary of Defense	488	150
Special Operations Command	82	283
Overall	8,281	7,742

Source: GAO analysis of Department of Defense (DOD) data. | GAO-24-107036

^aThe National Geospatial-Intelligence Agency is not required to participate in the SBIR/STTR programs and thus is exempt from the requirement for DOD components to issue solicitations with at least one open topic per fiscal year. 15 U.S.C. § 638(e)(2).

Open Topic Outreach and Support

DOD component officials stated that they promoted open topics to small businesses through various mechanisms. As of August 2024, DOD conducts outreach on the SBIR and STTR programs both through outreach led by the Office of the Undersecretary of Defense for Research and Engineering (OUSD R&E) and, in some cases, by individual components. According to DOD officials, DOD SBIR and STTR programs participate in both in-person and virtual events, which focus on aspects of the programs and may discuss differences between open and conventional topics. Programs across DOD also conduct outreach on various social media sites and on component websites.

Additionally, according to an official from OUSD R&E, a portion of DOD’s outreach efforts were directed towards attracting new and diverse small businesses to the programs.³⁰ For example, one DOD official recently met with small businesses to provide an overview of DOD’s SBIR and STTR programs and to learn about challenges small businesses face. Officials noted that their outreach efforts were the same regardless of topic

³⁰While the SBIR and STTR Extension Act of 2022 does not require components to conduct outreach and assistance activities, the act included a provision for GAO to describe DOD’s outreach and assistance efforts to encourage and prepare new and diverse small business concerns to participate in open topics.

type. For example, one official from the Defense Advanced Research Projects Agency told us that the agency conducts outreach and provides assistance that targets new and diverse small businesses.

Specificity of Solicitations' Open Topics Varied Across Components, and Some Topics Were Narrowly Defined

The FY 2023 solicitation topics DOD identified as open topics were generally broader than those DOD identified as conventional topics, but some components' open topics were narrower—similar to their conventional topics. DOD issued guidance for components on developing their topics, but the guidance does not clearly indicate whether and how the specificity of components' open topics should differ from their conventional topics.

Topic Specificity

We found that the FY 2023 topics DOD identified as open topics were generally broader than those DOD identified as conventional topics, but some components' open topics were narrower—similar to their conventional topics. This was based on our analysis of the narrative elements of DOD's topics. Specifically, we categorized all topics into four categories: most narrow, somewhat narrow, somewhat broad, and most broad (see textbox).

Methodology for Analyzing Topics

We analyzed 507 Department of Defense solicitation topics, using the same methodology for open and conventional topics. Prior to our analysis, we anonymized all topics so that reviewers would not know which were open or conventional.

First, we coded each topic based on the extent to which narrative elements of the topic defined a specific (1) problem or need to be addressed, (2) technology area for the solution, and (3) technology stage. Technology stage refers to whether the topic called for integrating an existing technology, improving an existing technology, or developing a new technology. We use the term specific program to mean any program that has been formally approved and authorized, such as a major defense acquisition program.

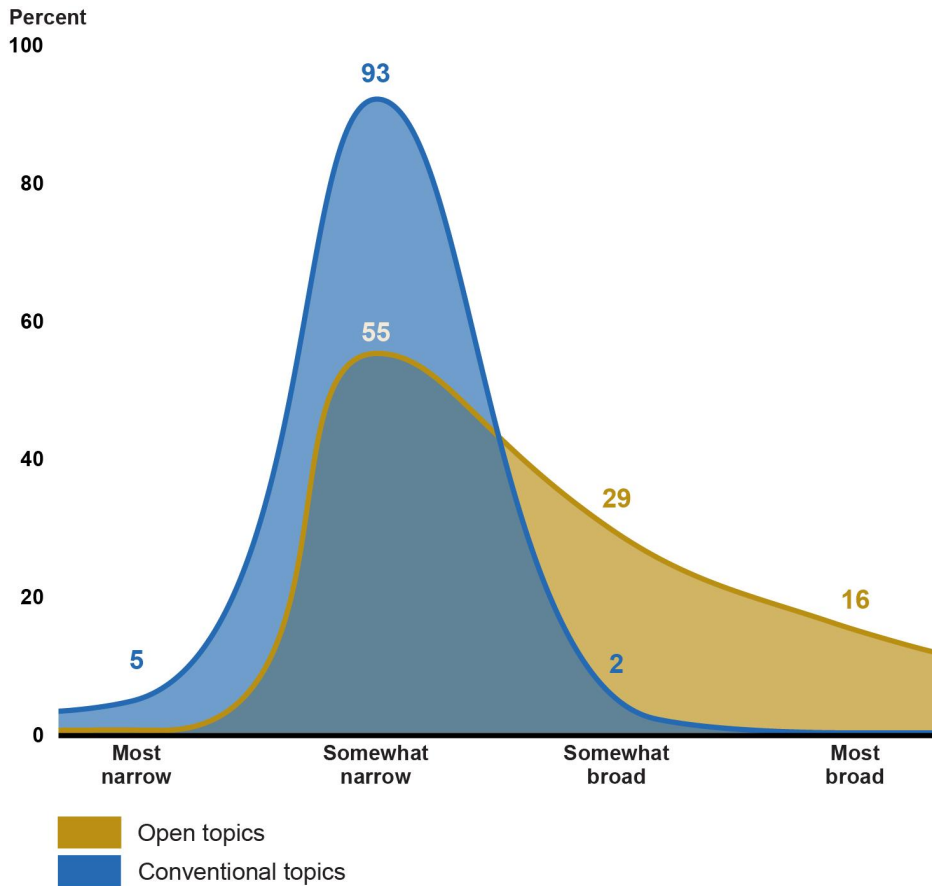
Then we averaged the three scores, weighted evenly, to develop a total score. We rounded these total scores to the closest whole number to create four categories.

We also analyzed the topics to determine the extent to which they identified a specific potential end user; however, we did not incorporate this analysis into our assessment of topic specificity. Results of our end user analysis are presented separately below.

Source: GAO. | GAO-24-107036

We categorized almost all of DOD's FY 2023 conventional topics as somewhat narrow, but open topics ranged from somewhat narrow to most broad (see fig. 8):

Figure 8: Variation in DOD Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2023



Source: GAO analysis of information from the Department of Defense (DOD). | GAO-24-107036

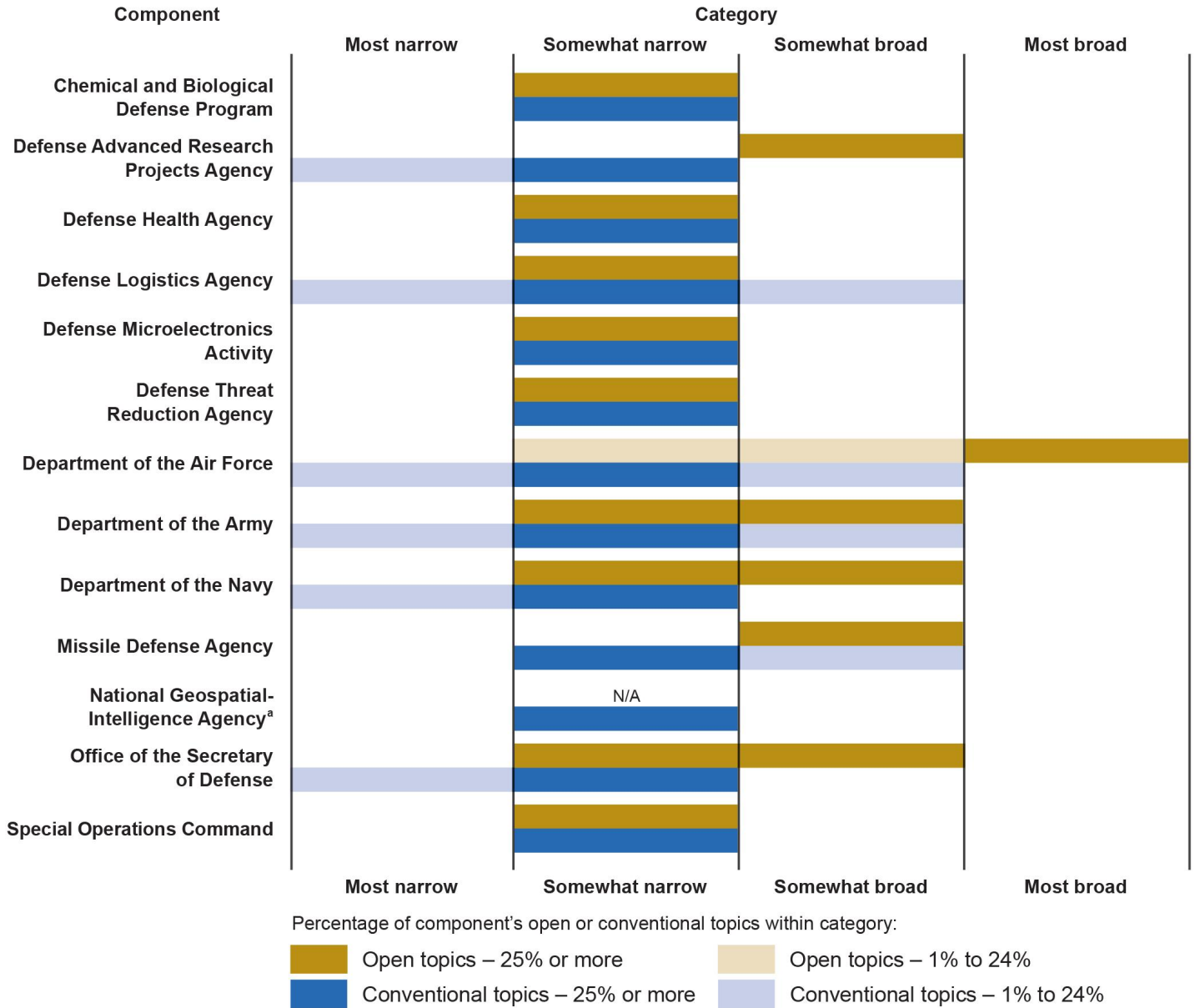
Note: Information includes topics released in solicitations for both SBIR and STTR. We categorized all 507 DOD topics into the four groups based on the extent to which topics defined a (1) problem or need to be addressed, (2) technology area for the solution, and (3) technology stage. Technology stage refers to whether the topic called for integrating an existing technology, improving an existing technology, or developing a new technology.

- Most narrow.** We categorized few conventional topics and no open topics as most narrow. These topics generally required a specific DOD problem or need to be addressed, and they required a specific technology area for the solution. They also required or prioritized existing technologies (e.g., off-the-shelf commercial technologies) to be integrated into DOD programs, as opposed to new technologies. For example, one topic sought businesses that could manufacture specific ball bearings from a parts list that DOD would provide. The topic explicitly stated that the proposal was intended for manufacturing businesses, not engineering businesses.
- Somewhat narrow.** We categorized nearly all conventional topics and over half of open topics as somewhat narrow. These topics generally required or prioritized a specific problem or need to be addressed, but they allowed businesses to propose solutions in identified technology areas. For example, one solicitation for a conventional topic sought an unpiloted glider able to measure ocean environments for 48 hours. One solicitation for an open topic sought 5G solutions to provide radio frequency communications for interior structures such as warehouses and hangar bays.

- **Somewhat broad.** We categorized about one-third of open topics and few conventional topics as somewhat broad. These topics generally prioritized or expressed interest in proposals that addressed specific problems in specific technology areas. However, they provided more flexibility than the topics we categorized as somewhat narrow. For example, one solicitation for an open topic sought clean energy and energy demand reduction technology solutions, including storage and generation, to address energy-related challenges. A solicitation for a conventional topic sought technologies to remotely breach obstacles such as mines and anti-tank ditches, which adversaries create to block movement.
- **Most broad.** We categorized about 15 percent of open topics and no conventional topics as most broad. These topics, all from the Air Force, allowed businesses to define problems or needs and propose solutions. For example, one open topic stated that proposals may address any problem area, industry, and technology—as long as they are relevant to the component’s mission.

We also found that topic specificity varied across components. Most components released at least some open and conventional topics that fell into the same categories of narrowness and broadness (see fig. 9). Based on our analysis, seven of 12 components’ open topics differed to some extent from their conventional topics. However, five of 12 components’ open topics did not differ from their conventional topics in the specificity with which they defined needs and potential solutions. According to an OUSD R&E official, some components’ missions may be more specific than others, which could affect the specificity of their open topics. For example, an official with the Defense Health Agency said that the agency must issue open topics within the health sector because that is the scope of its mission and the background of its subject matter experts.

Figure 9: Variation in DOD Open and Conventional Topics in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, by Component, FY 2023



Source: GAO analysis of information from the Department of Defense (DOD). | GAO-24-107036

Notes: Information includes topics released in solicitations for both SBIR and STTR. The number of open topics released per component ranged from one to 10. The number of conventional topics released per component ranged from five to 164.

We categorized all 507 DOD topics into the four groups based on the extent to which topics defined a (1) problem or need to be addressed, (2) technology area for the solution, and (3) technology stage. Technology stage refers to whether the topic called for integrating an existing technology, improving an existing technology, or developing a new technology. Areas in the figure without color indicate that the component did not have any open or conventional topics within the category.

^aThe National Geospatial-Intelligence Agency is not required to participate in the SBIR/STTR programs and thus is exempt from the requirement for DOD components to issue solicitations with at least one open topic per fiscal year. 15 U.S.C. § 638(e)(2).

Finally, we found some differences between open and conventional topics in the extent to which they identified specific potential DOD or non-DOD end users of the technology.³¹ We previously reported that some agencies—such as DOD—use the SBIR/STTR programs to procure technologies that meet their mission needs. In these cases, the agency procuring the technology may be considered the primary end user.³² Other agencies generally allow businesses to identify potential end users outside of the agency. According to one DOD official, topics that mention a specific end user help small businesses envision how their technology would be used.

- **DOD end user.** A majority of both open and conventional topics provided a broad general use statement indicating that the technology could be incorporated for military or other DOD component use (79 and 55 percent, respectively). Additionally, only one open topic and 56 conventional topics identified a potential for the product to be incorporated into a specific DOD program (3 percent and 12 percent, respectively).
- **Non-DOD end user.** Conventional topics varied in specificity when identifying a non-DOD end user. For example, 19 percent of conventional topics identified a specific non-DOD use case (such as by the Federal Aviation Administration or commercial aviation training), 33 percent identified a specific sector in which the technology could apply (such as the medical sector), 22 percent provided a broad commercial use statement, and 26 percent did not identify any potential commercial end user. In comparison, 71 percent of open topics provided a broad commercial use statement. For example, one open topic stated that companies will provide a technology transition and commercialization plan for DOD and commercial markets. Only some open topics identified a specific non-DOD use case or specific sector (8 percent each). For example, one open topic stated that the end product is anticipated to be adopted by civil police and special weapons and tactics organizations. The remaining 13 percent of open topics did not identify any potential commercial end user.

Open Topic Guidance

DOD's *SBIR/STTR Program Innovation Open Topic Guidance* provides direction for DOD components on how to issue open topics. According to the guidance, its purpose is to provide a framework for meeting the intent of the statutory requirement while allowing flexibility for components. However, DOD's guidance does not clearly state that open topics should have a different level of specificity than conventional topics nor does it clearly indicate how they should differ.

Additionally, aspects of DOD's guidance could raise uncertainty for components regarding how broad or narrow DOD expects components' open topics should be. For example, the guidance states that open topics can use generalized mission requirements or specific technology areas to adapt commercial products or solutions to close capability gaps, improve performance, or provide technological advancements in existing capabilities. DOD's guidance also states that open topics may be broad or focus on a specific technology area or mission priority. However, we found in our analysis that specific technology areas were often associated with narrower conventional topics.

³¹DOD end users ranged from a specific program (most narrow) to no mention of a potential DOD user (most broad). Non-DOD end users ranged from a specific use case, such as other named government agencies, or a use within a sector (most narrow) to no mention of a potential non-DOD user (most broad).

³²[GAO-23-106338](#).

Although DOD's guidance does not clearly distinguish how the specificity of open topics should differ from conventional topics, the language in Section 7 of the SBIR and STTR Extension Act of 2022 suggests that Congress intended open topics to differ from conventional topics. In the act, Congress created DOD's new open topics program and distinguishes open topics from conventional topics in several ways. For example, the act says that this new open topics program has the following purposes:

- increase the transition of commercial technology to DOD,
- expand the small business nontraditional industrial base,
- increase commercialization derived from DOD investments, and
- expand the ability for small businesses to propose technology solutions to meet DOD needs.³³

The act requires DOD components to issue at least one open topic solicitation per fiscal year. Congress created the open topics program with this new DOD requirement, which suggests that Congress intended open topics to be distinct from conventional topics. If the topic types were the same, then it would not be necessary to create the open topics program to achieve these goals. Additionally, the act includes provisions for SBA and GAO to provide comparisons of open and conventional topics. For example, SBA is now required to report to congressional committees comparisons of open and conventional topics of participating agencies' SBIR and STTR programs.³⁴

DOD component officials told us that the current guidance was sufficient and they did not think additional guidance was necessary for them to implement open topics activities. However, the wide variation of topic specificity allowable under DOD's guidance could explain the variation we found in topics DOD identified as open. Without clear guidance on whether and how individual components' open topics should differ in specificity from their conventional topics, some components may continue to release open topics that are similar to their conventional topics, as they did in FY 2023. Clearer guidance could help DOD ensure that each component consistently releases open topics that are more broadly defined than its conventional topics, which would help DOD better implement innovation open topics activities in a way that fulfills the purposes of the act and promotes additional competition within the programs.

Conclusions

DOD components released open topic solicitations in FY 2023 as required by the SBIR and STTR Extension Act of 2022. However, while most DOD components released at least some open topics that were broader than their conventional topics, some components' open topics were similar to their conventional topics. DOD issued guidance on open topics, but this guidance does not clearly indicate that components should differentiate the specificity of open and conventional topics. Additionally, aspects of DOD's guidance could raise uncertainty for components as to whether open and conventional topics should be different. Clarifying DOD's guidance could help ensure that each component more consistently releases open topics that are more broadly defined than its conventional topics. This would help DOD better implement innovation open topics activities in a way that fulfills the purposes of the act. It could also help DOD avoid missing opportunities to

³³Pub. L. No. 117-183, § 7(a), 136 Stat. 2180, 2188 (2022) (codified at 15 U.S.C. § 638(ww)).

³⁴Pub. L. No. 117-183, § 7(a), 136 Stat. 2180, 2188 (2022) (codified at 15 U.S.C. § 638(b)(7)).

gather innovative proposals to address mission-related problems and to promote competition among DOD's small business applicants.

Recommendation for Executive Action

The Secretary of Defense should ensure that the Under Secretary of Defense for Research and Engineering revises the SBIR/STTR Program Innovation Open Topic Guidance to clarify how the specificity of open and conventional topics should differ. (Recommendation 1)

Agency Comments

We provided a draft of this report to the Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, and Transportation; Environmental Protection Agency; National Aeronautics and Space Administration; National Science Foundation; and Small Business Administration for review and comment.

The director of DOD's SBIR/STTR programs provided an email stating that DOD concurs with our recommendation without comment. The remaining 11 agencies did not have any comments on the report.

We are sending copies of this report to the appropriate congressional committees; the Secretaries of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, and Transportation; the Administrators of the SBA, Environmental Protection Agency, and National Aeronautics and Space Administration; the Director of the National Science Foundation; and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-6888 or BenedictH@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Hilary M. Benedict
Acting Director, Science, Technology Assessment, and Analytics

List of Committees

The Honorable Jack Reed
Chairman
The Honorable Roger Wicker
Ranking Member

Committee on Armed Services
United States Senate

The Honorable Jeanne Shaheen
Chair
The Honorable Joni Ernst
Ranking Member
Committee on Small Business and Entrepreneurship
United States Senate

The Honorable Mike Rogers
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Frank D. Lucas
Chairman
The Honorable Zoe Lofgren
Ranking Member
Committee on Science, Space, and Technology
House of Representatives

The Honorable Roger Williams
Chairman
The Honorable Nydia M. Velázquez
Ranking Member
Committee on Small Business
House of Representatives

Appendix I: Objectives, Scope, and Methodology

The SBIR and STTR Extension Act of 2022 includes provisions requiring GAO to issue a series of reports comparing several aspects of open and conventional topics of federal agencies participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.¹ The act also includes a provision for GAO to report on the Department of Defense's (DOD) efforts to encourage and prepare new small businesses to respond to these solicitations. This report examines: (1) the extent to which participating agencies issued SBIR and STTR awards from open topics in fiscal year (FY) 2022; (2) how participating agencies' FY 2022 open and conventional topic awards compare in terms of competition, participation of nontraditional small businesses, timeliness of awards, and commercialization of technologies—and factors that account for any differences; and (3) the status of DOD's open topics efforts and how DOD's FY 2023 open and conventional topics compare in terms of specificity.

The scope of work includes the Small Business Administration (SBA) and the 11 participating agencies, including 30 components within the 11 agencies (see fig. 2 above). We identified possible components through our past work. We then asked agency officials to identify which of those components, along with any others, developed their own topics in fiscal years 2022 and 2023.

To address our objectives, we (1) collected and analyzed data to summarize and compare open and conventional topics awards from FY 2019 through 2022; (2) summarized and compared DOD open and conventional topics from FY 2023; and (3) interviewed agency officials, reviewed related documentation, and compared DOD open topic efforts to statutory and policy requirements.

Summary and Comparison of Open and Conventional Topic Awards

To summarize and compare open topic and conventional topic awards from FY 2019 through 2022, we obtained data from multiple sources, assessed reliability, cleaned the data as needed, merged the data into a single data set, and compared summary data on award outcomes and timeliness.

SBA Award Data and Registry Data

To expand upon our prior analysis of participating agencies' awards from FY 2019 through 2021, we collected and analyzed agencies' award data for FY 2022.² This was the most recent year with sufficiently reliable data available during our review. We downloaded publicly available award-level data from SBA's SBIR.gov webpage, using an application programming interface.³ The data include information on each award issued, the agency issuing the award, and the small business receiving the award (e.g., whether the business was women-owned at the time of award).

We found that many of the awards were missing a unique identifier for the small business (DUNS number). To fill in missing identifiers, we requested data from SBA's company registry. The registry is an SBA database of

¹Pub. L. No. 117-183, § 7(b), 136 Stat. 2180, 2188-89.

²For more information on how we collected data from FY 2019 through 2021, see [GAO-23-106338](#).

³SBIR Award Data (accessed November 2, 2023).

companies registered to participate in the SBIR and STTR programs. The database includes fields that describe the businesses, including their DUNS number, as of the businesses' most recent SBIR/STTR proposal. We used analytical software to merge the registry data with the award data, matching observations on company name. We then filled in missing DUNS numbers in the award data with DUNS numbers from the registry data.⁴ To assess reliability of the merged data set, we conducted tests to identify outliers and invalid values (according to the data dictionary).

For the award and registry data, we collected written responses from agencies on issues we identified. Based on agency responses, we cleaned the data, including updating values or changing invalid values to missing. After cleaning the data, we found the data elements we used for the purposes of our report to be sufficiently reliable.⁵

Participating Agency Open and Conventional Topic Data

We then generated a field showing whether each award originated from an open or conventional topic in FY 2022. To populate the field, we either merged in agency data provided (matching on award number) or entered values based on agency information provided. For example, one agency component stated that all of its grants were from open topics and all of its contracts were from conventional topics. For that component, we populated the field based on award type (grant or contract). We collected additional data and information from agencies until all awards in the award data were categorized as originating from open or conventional topics.

Once the data were complete, we analyzed the data to summarize and compare open and conventional topics awards. Specifically, we calculated the concentration of awards among small businesses and calculated the proportion of awards given to small businesses owned by women and individuals from socially and economically disadvantaged groups.⁶ In addition, we calculated notification and issuance times using the solicitation close date, date that agencies notified small businesses of award, and award issuance date. We then compared the calculated number of days with the SBA policy directive's required and recommended timelines for each agency.

System for Award Management (SAM.gov) Registry Data

To obtain information on whether awards were issued to veteran-owned small businesses, we used the General Services Administration's SAM.gov registration data for FY 2022. Small businesses are required to register on SAM.gov before submitting a SBIR/STTR or other federal proposal, and registrations are valid for 1 year. We conducted logic tests and found the data to be sufficiently reliable for our purposes. Using analytical software, we merged the SAM.gov data to our data set for FY 2022, matching on DUNS number and unique entity identifier. We then calculated the proportion of awards issued to veteran-owned small businesses.

⁴This uses the small business's DUNS number as of its most recent proposal as a proxy for DUNS number at the time of award in FY 2022.

⁵We did not assess the reliability of all fields (e.g., number of employees in the small business), because we did not use them for this report.

⁶Some awards were missing data on whether the small businesses were women-owned and socially and economically disadvantaged. When calculating the proportion of awards won by women-owned businesses and businesses owned by individuals from socially and economically disadvantaged groups, we did not include awards with missing data.

SBA Agency Tracking Data

We obtained award-level data from SBA that includes agency tracking numbers to connect Phase II awards with prior Phase I awards from FY 2019 through 2022. We conducted logic tests and found the data to be sufficiently reliable for our purposes. We then used the data to calculate the percentage of FY 2019 Phase I open and conventional topic awards that progressed to Phase II at any time from FY 2020 through 2022.

We did not analyze small businesses' progression to Phase III. In a prior report, we found that Phase III contracts listed in the Federal Procurement Data System could not be reliably matched to awards in the SBA award data.⁷

Summary and Comparison of DOD Open and Conventional Topics

To summarize and compare DOD's FY 2023 open and conventional topics, we collected FY 2023 SBIR/STTR solicitation topics, conducted a content analysis of topic language, and scored each topic on a scale from most narrow (most specific) to most broad (least specific).

Topic Identification

First, we collected a list of FY 2023 topics from DOD. We then downloaded each topic's documentation, which also included each topic's number, title, and solicitation language (and supplemental documents, if applicable) from the Defense SBIR/STTR Innovation Portal. To ensure that all topics were included, we cross-referenced the list to topics in the portal and SBA's publicly available topic data.⁸ We resolved discrepancies with DOD officials, which resulted in a list of 507 total topics.

Code Development

We used deductive and inductive qualitative methods to develop codes for our content analysis. This included deductively reviewing existing documentation and inductively reviewing DOD's topics to identify dimensions of narrowness and broadness. Specifically, we reviewed our past work, *DOD SBIR and STTR Program Innovation Open Topic Guidance*, an SBA online tutorial, and a National Bureau of Economic Research working paper.⁹ We also reviewed a sample of DOD's FY 2023 topics to examine how they were constructed and what types of language they used. We used all of this information to determine that topics may be narrow or broad in terms of the extent to which they specify (1) DOD problem or need to be addressed, (2) technology area for the solution, (3) technology stage for the solution, (4) potential DOD end user, and (5) potential non-DOD end user. We developed preliminary codes for these five dimensions.

Two analysts pretested the preliminary codes by independently coding a sample of the same 26 topics. We selected a purposeful sample of topics that covered all DOD components and both topic types. The analysts

⁷GAO-22-105223.

⁸Defense SBIR/STTR Innovation Portal (accessed August 5, 2024), <https://www.dodsbirsttr.mil/topics-app>; SBIR/STTR Topic Data (accessed August 5, 2024), <https://www.sbir.gov/topics>.

⁹GAO-23-106338; DOD, *Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program Innovation Open Topic Guidance* (March 28, 2023); SBA, Online Tutorials (accessed July 22, 2024), <http://www.sbir.gov/tutorials>; and Howell et al., *Opening Up Military Innovation: Causal Effects of Reforms to U.S. Defense Research*.

then reconciled differences and refined the codes as needed. This resulted in a final code list, as shown in table 13.

Table 13: Dimensions and Codes to Assess the Narrowness and Broadness of DOD’s FY 2023 Open and Conventional Topics

Dimensions	Codes from most narrow to most broad (one of four)	Codes from most narrow to most broad (two of four)	Codes from most narrow to most broad (three of four)	Codes from most narrow to most broad (four of four)
Problem or need	Requires addressing specific problem(s) identified by DOD	Prioritizes addressing specific problem(s) identified by DOD	Expresses interest in (or lists examples) addressing specific problem(s) identified by DOD	Allows addressing any problem related to DOD’s mission without priority or interest
Technology area for solution	Requires solution(s) in specific technology area(s)	Prioritizes solution(s) in specific technology area(s)	Expresses interest in (or lists examples of) solution(s) in specific technology area(s)	Allows solution(s) in any technology area without priority or interest
Technology stage for solution	Seeks existing technology (e.g., off-the-shelf products)	Seeks new technology or improvements on existing technology	Allows technology at any development stage	
DOD end user	Identifies very specific potential DOD user(s) (e.g., program)	Identifies specific potential DOD user(s) (e.g., component of a DOD component)	Identifies general potential DOD user(s) (e.g., DOD in general or DOD component)	Does not mention potential DOD user(s)
Non-DOD end user	Identifies very specific potential non-DOD user(s)	Identifies specific potential non-DOD user(s)	Identifies general potential non-DOD user(s)	Does not mention potential non-DOD user(s)

Source: GAO. | GAO-24-107036

Note: We assigned numerical scores for each topic, using the codes in each row (e.g., codes 1 through 4 related to the dimension of “problem or need”).

Coding

After finalizing the codes, we anonymized all topics (including the sample from the pretest) so that analysts would not know whether topics were open or conventional when coding them. Specifically, one analyst randomly sorted topics and assigned each topic a unique identifier instead of its topic code, because topic codes indicate the type of topic as part of their naming convention. The analyst also reviewed all topics and hid language in the topic title or solicitation language that indicated whether it was an open or conventional topic.

Two additional analysts conducted the content analysis. The second analyst coded all topics according to our code list for the five dimensions. The third analyst then reviewed the codes and provided comments where the two analysts disagreed. The two analysts then discussed results and settled on final coding.

Score Development and Analysis

To develop a score for each topic, we took a weighted average of coding for three dimensions: problem/need, technology area, and technology stage.¹⁰ We did not include the dimensions of DOD or non-DOD end user in the overall score, because DOD officials said that topics only state potential end users as examples to help

¹⁰We used a weighted average to ensure that all three dimensions were weighed evenly, although two were coded on 4-point scales and one was coded on a 3-point scale.

small businesses envision who may use their technologies. We then rounded scores to the nearest whole number so that each topic fit into one of four categories: most narrow, somewhat narrow, somewhat broad, or most broad.

Finally, we used the unique identifier that we assigned to each topic to match topics back with their topic types and components, and we summarized the findings accordingly.¹¹ In addition, we collected and analyzed data from DOD on the number of proposals received for each topic.

Agency Interviews and Documentation

We interviewed officials or collected written responses from participating agencies on their SBIR/STTR program attributes and use of open topics. Regarding program attributes, we collected information on technology areas funded, typical or targeted end users of technologies funded (e.g., consumers, federal agencies), and funding mechanisms (e.g., grants, contracts), among other things. Regarding use of open topics, we collected information on participating agencies' use of open topics in FY 2022 and any anticipated future changes. We also interviewed DOD officials on steps DOD has taken to implement open topics and to conduct outreach and assistance efforts to encourage and prepare new and diverse small businesses to participate in open topics.

We reviewed the SBIR and STTR Extension Act of 2022 and DOD's *SBIR/STTR Program Innovation Open Topic Guidance*. We then compared the status of DOD's open topic efforts to statutory and guidance requirements.

¹¹In our analysis we defined few to be 20 percent or less, many to be greater than 20 percent but less than 50 percent, and most to be 50 percent or greater.

Appendix II: Agency Timeliness in Notifying Businesses and Issuing Awards

The tables below provide information on agencies' timeliness in notifying businesses and issuing open and conventional topic awards. For more information on how we calculated timeliness, see appendix I.

Table 14: Agencies' Timeliness in Notifying Businesses of Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022

Percentage of open and conventional topic awards with on-time notifications

Agency	Open topic awards	Conventional topic awards
Department of Commerce	43%	N/A
Department of Defense	66%	84%
Department of Education	100%	N/A
Department of Energy	86%	99%
Department of Health and Human Services	93%	99%
Department of Homeland Security	N/A	100%
Department of Transportation	N/A	97%
Environmental Protection Agency	N/A	100%
National Aeronautics and Space Administration	N/A	74%
National Science Foundation	70%	N/A
U.S. Department of Agriculture	62%	N/A

Source: GAO analysis of data from the Small Business Administration (SBA) and participating agencies. | GAO-24-107036

N/A = agency did not issue awards from the topic type

Note: Information includes SBIR and STTR awards. All 11 agencies participated in SBIR, and five of the agencies participated in STTR. SBA's policy directive requires these agencies to notify businesses within 90 calendar days after a solicitation closes, except the National Science Foundation and the National Institutes of Health within HHS, which have 1 year to notify businesses. Awards with missing data on notification timeliness are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent. FY = fiscal year.

Table 15: Agencies' Timeliness in Issuing Awards in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs, FY 2022

Percentage of open and conventional topic awards with on-time issuance

Agency	Open topic awards	Conventional topic awards
Department of Commerce	51%	N/A
Department of Defense	80%	62%
Department of Education	95%	N/A
Department of Energy	100%	99%
Department of Health and Human Services	88%	88%
Department of Homeland Security	N/A	89%
Department of Transportation	N/A	83%
Environmental Protection Agency	N/A	100%

Appendix II: Agency Timeliness in Notifying Businesses and Issuing Awards

Agency	Open topic awards	Conventional topic awards
National Aeronautics and Space Administration	N/A	91%
National Science Foundation	89%	N/A
U.S. Department of Agriculture	81%	N/A

Source: GAO analysis of data from the Small Business Administration (SBA) and participating agencies. | GAO-24-107036

N/A = agency did not issue awards from the topic type

Note: Information includes SBIR and STTR awards. All 11 agencies participated in SBIR, and five of the agencies participated in STTR. SBA's policy directive provides that these agencies should issue an award within 180 calendar days after a solicitation closes, except the National Science Foundation and the National Institutes of Health within HHS, which have 15 months. Awards with missing data on issuance timeliness are not included in the denominators for percentage calculations. Percentages are rounded to the nearest 1 percent. FY = fiscal year.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Hilary Benedict at (202) 512-6888 or BenedictH@gao.gov

Staff Acknowledgments

In addition to the contact named above, Christopher Murray (Assistant Director), Caitlin Dardenne (Analyst-in-Charge), Kelsey L. Kennedy (Analyst-in-Charge), Victoria Aysola, David Dornisch, Caroline Gross, Won Lee, Madeline Mara, Matty Njie, Joseph Rando, and Maura Sullivan contributed to the report.

GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through our website. Each weekday afternoon, GAO posts on its [website](#) newly released reports, testimony, and correspondence. You can also [subscribe](#) to GAO's email updates to receive notification of newly posted products.

Order by Phone

The price of each GAO publication reflects GAO's actual cost of production and distribution and depends on the number of pages in the publication and whether the publication is printed in color or black and white. Pricing and ordering information is posted on GAO's website, <https://www.gao.gov/ordering.htm>.

Place orders by calling (202) 512-6000, toll free (866) 801-7077, or TDD (202) 512-2537.

Orders may be paid for using American Express, Discover Card, MasterCard, Visa, check, or money order. Call for additional information.

Connect with GAO

Connect with GAO on [Facebook](#), [Flickr](#), [X](#), and [YouTube](#).

Subscribe to our [RSS Feeds](#) or [Email Updates](#). Listen to our [Podcasts](#).

Visit GAO on the web at <https://www.gao.gov>.

To Report Fraud, Waste, and Abuse in Federal Programs

Contact FraudNet:

Website: <https://www.gao.gov/about/what-gao-does/fraudnet>

Automated answering system: (800) 424-5454 or (202) 512-7700

Congressional Relations

A. Nicole Clowers, Managing Director, ClowersA@gao.gov, (202) 512-4400, U.S. Government Accountability Office, 441 G Street NW, Room 7125, Washington, DC 20548

Public Affairs

Sarah Kaczmarek, Managing Director, KaczmarekS@gao.gov, (202) 512-4800, U.S. Government Accountability Office, 441 G Street NW, Room 7149
Washington, DC 20548

Strategic Planning and External Liaison

Stephen J. Sanford, Managing Director, spel@gao.gov, (202) 512-4707
U.S. Government Accountability Office, 441 G Street NW, Room 7814, Washington, DC 20548