United States Government Accountability Office

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FISCAL YEAR 2022 BUDGET REQUEST

U.S. Government Accountability Office

Statement of Gene L. Dodaro
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Highlights

Highlights of GAO-21-510T, a testimony before the Subcommittee on the Legislative Branch, Committee on Appropriations, U.S. Senate

Background

GAO's mission is to support Congress in meeting its constitutional responsibilities and to help improve the performance and ensure the accountability of the federal government for the benefit of the American people. We provide nonpartisan, objective, and reliable information to Congress, federal agencies, and to the public, and recommend improvements across the full breadth and scope of the federal government's responsibilities.

In fiscal year 2020. GAO issued 691 products, and 1,459 new recommendations. Congress used our work extensively to inform its decisions on key fiscal year 2020 and 2021 legislation. Since fiscal year 2000, GAO's work has resulted in over:

- $1.2 trillion dollars in financial benefits; and
- 25,328 program and operational benefits that helped to change laws, improve public services, and promote sound management throughout government.

As GAO recognizes 100 years of non-partisan, fact-based service, we remain committed to providing program and technical expertise to support Congress in overseeing the executive branch; evaluating government programs, operations and spending priorities; and assessing information from outside parties.

View GAO-21-510T. For more information, contact Gene L. Dodaro at (202) 512-5555 or dodarog@gao.gov.

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In fiscal year (FY) 2020, GAO's work yielded $77.6 billion in financial benefits, a return of about $114 for every dollar invested in GAO. We also identified 1,332 other benefits that led to improved services to the American people, strengthened public safety, and spurred program and operational improvements across the government. In March 2021, GAO reported on 36 areas designated as high risk due to their vulnerabilities to fraud, waste, abuse, and mismanagement or because they face economy, efficiency, or effectiveness challenges. In FY 2020 GAO's High Risk Series products resulted in 168 reports, 26 testimonies, $54.2 billion in financial benefits, and 606 other benefits.

In this year of GAO's centennial, GAO's FY 2022 budget request seeks to lay the foundation for the next 100 years to help Congress improve the performance of government, ensure transparency, and save taxpayer dollars. GAO's fiscal year (FY) 2022 budget requests $744.3 million in appropriated funds and uses $50.0 million in offsets and supplemental appropriations. These resources will support 3,400 full-time equivalents (FTEs). We will continue our hiring focus on boosting our Science and Technology and appropriations law capacity. GAO will also maintain entry-level and intern positions to address succession planning and to fill other skill gaps. These efforts will help ensure that GAO recruits and retains a talented and diverse workforce to meet the priority needs of the Congress.

In FY 2022, we will continue to support Congressional oversight across the wide array of government programs and operations. In particular, our science and technology (S&T) experts will continue to expand our focus on rapidly evolving (S&T) issues. Hallmarks of GAO's (S&T) work include: (1) conducting technology assessments at the request of the Congress; (2) providing technical assistance to Congress on science and technology matters; (3) continuing the development and use of technical guides to assess major federal acquisitions and technology programs in areas such as technology readiness, cost estimating, and schedule planning; and (4) supporting Congressional oversight of federal science programs.

With our requested funding, GAO will also bolster capacity to review the challenges of complex and growing cyber security developments. In addition, GAO will continue robust analyses of factors behind rising health care costs, including costs associated with the ongoing COVID-19 Pandemic.

Internally, the funding requested will make possible priority investments in our information technology that include the ability to execute transformative plans to protect data and systems. In FY 2022 GAO will continue to implement efforts to increase our flexibility to evolve IT services as our mission needs change, strengthen information security, increase IT agility, and maintain compliance. We will increase speed and scalability to deliver capabilities and services to the agency.

This request will also help address building infrastructure, security requirements, as well as tackle long deferred maintenance, including installing equipment to help protect occupants from dangerous bacteria, viruses, and mold. As reported in our FY 2020 financial statements, GAO's backlog of deferred maintenance on its Headquarters Building had grown to over $82 million as of fiscal year-end.

Chairman Reed, Ranking Member Braun, and Members of the Subcommittee, thank you for the opportunity to discuss our fiscal year (FY) 2022 budget request. I greatly appreciate the subcommittee's support of our efforts to serve the Congress and improve the federal government's performance, accountability, and transparency.

For the past 100 years, the United States Government Accountability Office (GAO) has provided reliable, professional, fact-based, non-partisan information to Congress and the American people on a host of domestic and international challenges and priorities. In this year of GAO's centennial, and with an eye towards laying the foundation for the next 100 years, I am honored to present GAO's fiscal year (FY) 2022 budget request to help Congress improve the performance of government, ensure transparency, and save federal funds.

With this support, GAO has identified over $1 trillion dollars in financial benefits and more than 21,000 program and operational benefits since 2005. Our average return on investment for the past five years is $165 to $1. We also generated, on average, over 1,300 program and operational benefits to produce a more effective and efficient government during the same the period. Congress also responded to GAO's work through dozens of legislative changes to federal programs.

During the global pandemic we recognize the gravity of our responsibilities to provide Congress and the Nation real time auditing and timely reporting on a dynamic situation that impacts everyone. As such, we have issued six bimonthly reports on the pandemic that cover the entire government-wide response to the public health and economic crises. They include 72 recommendations for agency actions and four matters for congressional consideration since June 2020 to enhance the nation's response to ongoing challenges related to the pandemic.

Fiscal Year 2022 Request

To build on this success, for FY 2022, GAO is requesting $744.3 million in appropriated funds, a 12.6 percent increase, and authority to use $38.9 million in offsetting collections. We recognize that this comes at a time when there are increased concerns about the level of federal spending; however, as demonstrated above, GAO has a proven record of delivering a sound return on investment. These past investments in GAO have helped profoundly improve federal government operations and routinely supported Congress in making well-informed decisions. Thus, I am fully confident that this fiscal year's investment will continue to enable us to provide timely support to the Congress and help improve the performance and accountability of the federal government.

The chart below provides a summary by program for the FY 2022 request.

Table 1: FY 2020 – 2022 Summary of Resources by Program (dollars in thousands)

	Fiscal Year 2020 Actual		Fiscal Year 2021 Enacted		Fiscal Year 2022 Request		Net Change Fiscal Year 2021 / 2022	
Program	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Human capital	3,178	$551,725	3,180	$579,872	3,400	$635,477	220	$55,605
Engagement support		$6,489		$9,711		$14,765		$5,054
Infrastructure operations		$97,537		$128,456		$141,975		$13,519
Center for Audit Excellence		$1,004		$2,100		$2,100		0
Total budget authority	**3,178**	**$656,755**	**3,180**	**$720,139**	**3,400**	**$794,317**	**220**	**$74,178**
Offsets[a]		($26,764)		($59,000)		($50,000)		$9,000
Appropriation		**$629,991**		**$661,139**		**$744,317**		**$83,178**

Source: GAO. | GAO 21 510T

[a]Includes offsetting receipts and reimbursements from program and financial audits; rental income; training fees, collection of bid protest system user fees; supplemental funds for disaster audits; and for pandemic related audits.

GAO' requested FY 2022 funding level would enable GAO to continue to increase our capabilities to review the opportunities and challenges associated with evolving science and technology issues; complex and growing cyber security developments; and rising health care costs. Specifically

- **Science and Technology**. These resources will allow us to expand our science and technology capabilities in accordance with the 2019 plan provided to Congress to bolster our technology assessments and other science and technology (S&T) assistance to Congress, and help ensure that GAO has the bandwidth and expertise to support audits where this expertise is critical in addressing congressional priorities.
- **CyberSecurity**. GAO will continue to expand our expertise and ability to assess the cybersecurity challenges facing the Nation, including assessments of the implementation of the National Cyber Strategy, government global cyberspace strategies, and government and private sector efforts to address the impact of the SolarWinds intrusion.
- **Health Care Spending**. GAO will continue to examine the sustainability and integrity of the Medicare and Medicaid programs and to oversee VA, DOD, and Indian Health Service health care services. Health care spending now accounts for over 25 percent of

the federal budget and is one of the fastest growing federal expenditures.

The FY 2022 budget also builds upon the planned investments in GAO's Information Technology Modernization efforts. This request prioritizes GAO's multi-year effort to ensure that it has the 21st century tools and technologies needed to support our workforce and achieve our mission, including enhanced cloud data management and storage solutions, and IT security upgrades to combat the ever-growing cybersecurity threats toward U.S. assets.

Further, this request supports significant investments in improving the health and safety environment of our facilities; enhanced building security requirements; and long deferred infrastructure maintenance needs in anticipation of our workforce returning to the workplace. The GAO workforce continues to be our most critical asset and it is imperative that GAO provide a safe and secure workplace.

Finally, I am looking beyond GAO's near-term and immediate needs. I am confident continued investments in GAO, coupled with the stellar talents of our diverse and professional workforce, will strengthen our ability to not only address today's highest priorities, but also provide Congress and the American public with timely insightful analysis on the future challenges facing the country.

Moving forward, GAO will continue to build on bodies of work related to our three broad strategic goals for supporting Congress and the Nation, to (1) address current and emerging challenges to the well-being and financial security of the American people; (2) help the Congress respond to changing security threats and the challenges of global interdependence; and (3) help transform the federal government to address national challenges.

Highlights from FY 2020 Results

GAO's mission is to support the Congress in meeting its constitutional responsibilities, and to help improve the performance and ensure the accountability of the federal government for the benefit of the American people. Our FY 2020 performance results demonstrate GAO's unwavering commitment to our role as the Congress' watchdog.

Financial Benefits

In FY 2020, we documented $77.6 billion in financial benefits for the government – a return of about $114 for every dollar invested in us. Examples of financial benefits we are reporting for this year included those contributing to

- revisions to spending limits for Medicaid demonstration projects ($29.4 billion);
- termination of the Department of Energy's (DOE) Mixed Oxide Fuel Fabrication Facility (MOX) project to dispose of plutonium (about $13.0 billion);
- reductions and rescissions made to DOD's accounts for the development and procurement of weapons (about $2.3 billion);
- changes in DOD's payment policy to cover only FDA-approved drugs for compounded drugs in the TRICARE program ($1 billion); and
- reduced appropriations for certain under-obligated Department of State (State) accounts in FY 2019 ($950 million).

Legislative Impacts

The Congress continues to use GAO's work to inform key legislative decisions, some of which will result in billions in future financial savings. Examples linked directly to GAO's work include

Consolidated Appropriations Act, 2021 (December 2020) and Joint Explanatory Statements included numerous actions based on GAO's work, including the Congress

- providing additional funding to continue the cleanup of the waste site of the radioactive and hazardous materials under the 324 Building at the Hanford site, and directing the implementation of a GAO recommendation for increased surveillance, maintenance, and risk reduction activities associated with legacy waste sites;
- requiring the Social Security Administration, to the extent feasible, to provide Treasury's Do Not Pay Working System access to its full death data for a three-year period, beginning in December 2023, to prevent improper payments;
- repealing a provision of the Middle Class Tax Relief and Job Creation Act of 2012 mandating that the Federal Communications Commission auction the T-Band radio spectrum, allowing law-enforcement, fire officials, and Emergency Medical Services to continue using the T-Band spectrum to operate their radios for day-to-day life saving operations [Don't Break up the T-Band Act (December 2020)]; and
- directing IRS to report on progress toward implementing GAO's recommendations aimed at addressing the numerous deficiencies in the IRS's cyber controls that increased the risk that IRS's network devices and systems could be used by unauthorized individuals to access sensitive taxpayer data.

The Fiscal Year 2021 **National Defense Authorization Act** (January 2021) and Joint Explanatory Statements included numerous actions based on GAO's work, including the Congress

- reviewing unobligated balances and reducing DOD's FY 2021 Operation and Maintenance Accounts;
- establishing the statutory National Cyber Director position in the Executive Office of the President with the authorities GAO identified;
- directing DOD take steps to assess its processes for dealing with contractors with violations of safety, health and fair labor standards; and
- directing DOD to clearly identify the associated goals, risks, and costs of re-designing the Autonomic Logistics Information System (ALIS), which is the information infrastructure used in the joint strike fighter.

The **Setting Every Community Up for Retirement Enhancement Act of 2019** (December 2020). Based on GAO's work, Congress expanded access to retirement plans for millions of long-term, part-time employees who previously were not eligible to save and invest in their employer-based retirement savings plans.

The **Federal Advance Contracts Enhancement (FACE) Act** (December 2020). Based on GAO's work, the Congress directed the Federal Emergency Management Agency (FEMA) to (1) update its advance contracting strategy, (2) issue new guidance to its contracting workforce on the use of advance contracts, (3) promote advance contracts to local and state governments, and (4) improve the use of the agency's program to track major acquisitions.

The **Johnny Isakson and David P. Roe, M.D. Veterans Health Care and Benefits Improvement Act of 2020** (January 2021). Based on GAO's work, Congress required the Department of Veterans Affairs (VA) to develop a plan to address all the GAO-identified high-risk areas; report on progress in implementing open priority recommendations; and to take actions addressing timely access, and monitoring of medical examiners' training.

The **Secure Federal Leases from Espionage and Suspicious Entanglements Act** (December 2020). Based on GAO's work, required the government to identify who owns the office space it leases in order to prevent possible security threats.

The **STOP FGM Act of 2020** (January 2021). Based on GAO's work, the Act required certain federal agencies to report annually on, among other things, their efforts to educate and assist communities and key stakeholders about female genital mutilation.

Other Benefits

Many other benefits resulting from our work lead to program and operational improvements. In FY 2020, we recorded 1,332 of these other benefits.

For example, our work on public safety and security

- Led the Federal Aviation Administration (FAA) to take steps to improve its oversight of small unmanned aircraft systems (UAS or "drones")—to prevent these systems from endangering life and property—through better communication with its law enforcement partners about the information it needs on unsafe UAS operations; and
- Led several federal agencies to take steps to more fully establish key elements of a cybersecurity risk management program and/or conduct an agency-wide assessment of cyber risks to better safeguard their agencies from the growing number of cyber threats. These actions included updating key policies and procedures to ensure that they are identifying, assessing, and responding to cyber risks.

Similarly, our work related to vulnerable populations

- Prompted the FEMA to improve the services it provides to disaster survivors with disabilities by (1) using new registration-intake questions to better identify their needs, (2) establishing related objectives in its 2019-2022 Strategic Plan, and (3) seeking feedback on its new approach to service delivery; and
- Led to agreement by Customs and Border Protection to improve the (1) guidance it uses to process and track family separations at the southwest border, and (2) oversight mechanisms for delivering medical care to those in its custody.

Furthermore, our work in the area of agency operations

- Led to agreement by the National Aeronautics and Space Administration (NASA) to develop a solid business case for its mission to return U.S astronauts to the moon by 2024, and include a comprehensive plan and full cost estimate for this mission; and

- Helped inform a Senate legislative proposal to build on progress made under the Chief Financial Officers Act of 1990 to further improve federal financial management, such as preparing financial management plans and better linking cost to performance.

Building Bodies of Knowledge

Through the products issued this year, we continued to build on bodies of work related to our three broad strategic goals to (1) address current and emerging challenges to the well-being and financial security of the American people, (2) help the Congress respond to changing security threats and the challenges of global interdependence, and (3) help transform the federal government to address national challenges.

Protection of children and students. We reported on the need to (1) update or replace the heating, ventilation, and air conditioning (HVAC) systems in about 36,000 K-12 public schools, which is of heightened importance given COVID-19; and (2) address the physical barriers, such as accessible door hardware and steep ramps, that make it challenging for students, teachers, and others with disabilities to use public schools facilities.

Veterans. We reported on the need for (1) VA to improve how it tracks and analyzes the data on veteran suicides that occur on its campuses, such as medical facilities, to better understand and prevent such suicides; (2) VA to strengthen its oversight of the quality of state veterans homes, which provide skilled nursing and personal care to about half of eligible veterans—especially given COVID-19; (3) VA to take steps to more efficiently and effectively acquire medical and surgical supplies; and (4) the Office of Personnel Management (OPM) and agencies to better leverage data to improve the retention of veterans in federal jobs, which is lower than the retention of similar non-veterans.

Health care. We reported on the need to (1) address infection control deficiencies in nursing homes to help safeguard residents from outbreaks like COVID-19; and (2) determine more precisely the magnitude of antibiotic resistance—which sickens about 2.8 million people annually—and strengthen federal efforts to minimize its effects.

Science and Technology. We reported on (1) COVID-19—Coronaviruses, Social Distancing During Pandemics, COVID-19 Modeling, COVID-19 Testing, COVID-19 Vaccine Development, Herd Immunity, and Contact Tracing Applications; (2) policy options for the use of Artificial Intelligence to deliver health care services; (3) data quality considerations for modeling and analysis of infectious diseases, such as COVID-19; (4) algorithms used in forensic science for federal law enforcement, such as DNA, fingerprints, and facial recognition; and (5) irrigated agriculture technologies, practices, and implications for water

scarcity. In addition, we reported on federal agencies' use of the Internet of Things (IoT) devices. We also expanded our use of Science and Tech Spotlights that distill complex issues into a 2-page summary on topics covering CRISPR gene editing; 5G wireless technologies; and quantum technologies. We have issued over 20 Science and Technology Spotlights since its inception in late 2019 including the most recent, in February, on Vaccine Safety.

COVID-19 Response and Recovery. As required under the CARES Act GAO has conducted ongoing monitoring and oversight of the federal government's $4.5 trillion response to prepare for, respond to, and recover from the COVID-19 pandemic. This has included providing monthly briefings and reporting on a bimonthly basis until March 2021 and on a quarterly basis beginning in July 2021. We are to report on, among other things, the effect of the pandemic on the public health, economy, and public and private institutions.

As of April 12th, 66 of GAO's previous 72 COVID-19 recommendations for agency actions remained unimplemented. These include such critical areas as vaccine distribution and communications plans, medical supply chains, and workplace safety. GAO is pleased that the Consolidated Appropriations Act passed by Congress in December required a number of actions that are consistent with several of our open recommendations and we will monitor the implementation of the Act's requirements. Finally, consistent with the CARES Act, GAO is to continue its oversight of the federal pandemic response under the American Rescue Plan, and GAO will continue to follow up on its past recommendations and make new ones, as warranted.

Disaster Preparedness, Recovery, and Resilience. In FY 2020 alone, we used supplemental disaster audit funding to issue 32 products and made 56 recommendations in four key areas: (1) National preparedness, including the need for FEMA to address national emergency management capabilities based on information known about states' and territories' response and recovery capabilities; (2) FEMA workforce, including its efforts to assess how it deploys its disaster workforce to meet mission needs; (3) Disaster loans, including the need to mitigate and identify risk—such as extended power outages—to disaster loan processing, and, (4) Survivor assistance, such as the need for FEMA to better explain its program information and eligibility decisions to applicants. We also issued a Disaster Resilience Framework to help the federal government promote resilience to natural disasters.

Between November 2017 and March 2021, we issued 66 reports and identified three Matters for Congressional Consideration and 159 recommendations to 16 agencies, including FEMA, the U.S. Department

of Housing and Urban Development (HUD), and SBA. As of the third quarter FY 2021, 23 percent of the recommendations made between FY 2018 and FY 2021 have been implemented. Since implementing our recommendations, FEMA can better (1) identify survivors' disability-related needs; (2) estimate the number of staff needed to administer Public Assistance recovery efforts; and (3) help ensure that its contracting personnel know to reach out to state and local governments to create and use contracts before disasters hit.

While one of our Matters had been fully implemented by year end, we also provided the Congress with technical assistance on draft legislation in five areas: (1) potential reforms to the National Response Framework, (2) possible creation of a national disaster safety board, (3) loans to fund disaster resilience efforts, (4) reforms to federal advance contracts, and (5) permanently authorizing the Community Development Block Grant Disaster Recovery program. As of January 2021, we had 19 disaster-related audits underway.

High-risk areas. In March 2021 we issued the biennial update of our High Risk Report to focus attention on government operations that are vulnerable to fraud, waste, abuse, and mismanagement or need transformation—offering solutions to 36 high-risk problems (See Appendix I). In most areas, progress since our last high risk update has been limited. In five areas the ratings declined, while in seven areas they improved. One area—DOD Support Infrastructure Management—improved to the point of removal from the list. Two new areas—National Efforts to Prevent, Respond to, and Recover from Drug Misuse, and Emergency Loans for Small Businesses—are being added to the list.

Where progress has been made addressing high-risk areas, the results have been substantial. For example, over the past 15 years (FY 2006 through FY 2020) financial benefits totaled nearly $575 billion, or an average of about $38 billion per year. Since our last update in 2019, we have recorded approximately $225 billion in financial benefits. In FY 2020 alone, our high-risk work yielded $54.2 billion in financial benefits, 606 other benefits, 168 reports, and 26 testimonies.

Fragmentation, overlap, and duplication. In 2020, we issued our tenth annual report. It identified 168 new actions in 29 new areas (and 10 existing areas) that could reduce fragmentation, overlap, and duplication, or provide other cost savings and opportunities to enhance revenue across the federal government. From 2011 to 2019, we identified 908 such actions. As of May 2020, the Congress and executive branch agencies had fully addressed 519 of these actions and partially addressed 202, yielding about $429 billion in financial benefits—$393

billion between 2010 and 2019, and $36 billion more projected in the future.

Serving Our Clients

In FY 2020, we received 550 requests for work from 90 percent of the standing committees of the Congress—supporting a broad range of congressional interests. We issued 586 reports and made 1,459 new recommendations. We were asked to testify 59 times before 43 separate committees or subcommittees on topics including COVID-19; disaster preparedness, response, and recovery; 2020 U.S. Census; the Chief Financial Officers Act; and the nation's fiscal health. GAO also delivered five member briefings, and we were asked to submit (1) four Statements for the Record in lieu of testifying; and (2) responses to 27 sets of Questions for the Record, which become part of the official hearing records. GAO executives also participated in seven roundtables sponsored by congressional committees, subcommittees, or working groups. Moreover, GAO's work was cited by Members of the Congress and witnesses in 79 hearings beyond those at which we testified.

The following, are examples of topics GAO addressed in testimony in FY 2020.

Figure 1: Selected GAO Fiscal Year 2020 Testimony Topics

Source: GAO | GAO-21-510T

I continued to meet with the Chairs and Ranking Members of congressional committees to obtain their views on GAO's work, including their priorities, and to discuss opportunities and challenges facing our Nation. In addition, GAO continued to highlight the status of key

recommendations in our annual duplication, fragmentation, and overlap report–citing progress made and the benefits of full implementation.

In FY 2020, agencies implemented 77 percent of our recommendations against a target of 80 percent matching our 2019 performance. I also continued to send letters to the heads of most federal departments, recognizing their progress in implementing our priority recommendations and calling attention to those still requiring action. These letters were also sent to congressional committees of jurisdiction to inform their oversight and published on our website.

Supporting Our People

The hard work and dedication of our diverse and professional multidisciplinary staff positioned GAO to achieve a 93 percent on-time delivery of our products in FY 2020. Our performance also indicates that staff received the support needed to produce high-quality work. We met or exceeded the targets for six of our seven people measures exceeding our targets for, retention rates with and without retirements, staff development, staff utilization, effective leadership by supervisors, and organizational climate. For the people measure of how satisfied GAO employees are with their IT tools, we fell short of our goal of 80 percent by 11 percentage points, at 69 percent. Although we did not meet our goal in this area, we did experience a 13-percentage point satisfaction increase over fiscal year 2019 and continue to seek areas of IT improvement.

FY 2022 Resource Planning and Deployment

In planning our audit work for FY 2022, we are requesting resources that will lay the long-term foundation that allows GAO to continue to provide the Congress with the high quality products it has come to rely on that focus on both the longstanding as well as emerging issues that concern the Nation. A key focus will be increasing our current focus on science and technology areas. In addition we will also bolster resources for identifying government-wide cybersecurity risks and the increasing cyber threat to the nation’s critical infrastructure. Another critical audit area this request will support are the challenges associated with growing health care costs.

In addition to these audit resources, GAO has internal needs to allow our auditors to better serve Congress. These internal investment needs include: accelerating IT modernization and cloud data management and storage solutions, as well as infrastructure enhancements and improvements to address remaining health and safety issues. Another internal high priority is to address the deferred maintenance backlog at GAO’s HQ Building, which includes multiple HVAC replacements.

GAO's Science and Technology Program

GAO's newest unit—the Science, Technology Assessment, and Analytics (STAA) team—helps address congressional science and technology needs in a variety of ways, including

- in-depth evaluation and oversight of federal science and technology programs;
- foresight on new and emerging technologies;
- evaluation of the effects and policy implications of science, technology, and innovation on society;
- innovating to support evidence-based policymaking through data analytics;
- exploring emerging technologies and supporting congressional modernization efforts;
- development of policy options that may help policymakers enhance the benefits and mitigate challenges of technologies; and
- proactive and on-demand technical assistance on science, technology, and innovation issues.

GAO's vision for STAA is to provide Congress with critical foresight, oversight, and insight of science and technology issues and harness the power of advanced analytics in order to ensure continued American security, innovation, and competitiveness in a rapidly changing world.

GAO continues to successfully conduct science and technology-related work, providing Members of Congress and their staffs with a variety of products and services. This has included issuing specialized reports known as technology assessments. In 2019, we committed to expanding resources to meet Congressional needs by establishing STAA, a team dedicated solely to S&T. Through our rigorous, fact-based foresight and oversight work, we can help Congress navigate the increasingly complex S&T advances it must oversee, including artificial intelligence (AI), quantum computing, infectious disease modeling, and rapid vaccine development and through our collaboration with the National Academies of Sciences, Engineering, and Medicine.

In 2020, STAA devoted significant resources to address the COVID-19 pandemic. For example, it issued a Science & Tech Spotlight on coronaviruses in early March, providing a high-level overview of what they are and how they are transmitted. It followed this with six additional Spotlights on COVID-19 topics, including social distancing, testing, contact tracing apps, and herd immunity. STAA staff also contributed

significant S&T expertise to the CARES Act reports. Reports on vaccine safety and Operation Warp Speed (OWS) vaccine development and manufacturing were issued in mid-February 2021.

STAA has played an important role in GAO's oversight of the federal response to the COVID-19 pandemic, further building our base of science and technology knowledge. Throughout the pandemic, STAA has provided Congress with technical assistance on COVID-19 on numerous occasions, on topics such as: how well facemask materials filter droplets and aerosols, differences among three prominent COVID-19 models, and the effectiveness of certain filtration systems in reducing respiratory disease transmission on airplanes. STAA also analyzed four COVID-19 vaccine developers' clinical trial protocols and reported in November on information the trials will provide and their limitations. STAA's work related to OWS features a first-of-its-kind digital dashboard to provide up-to-date details on vaccine technology development, manufacturing, and rollout.

Over the past year, STAA has also continued to expand its capacity to meet Congressional needs on other topics. STAA issued technology assessments on capabilities and challenges related to 5G wireless technology and artificial intelligence in health care, among other topics.

- *5G Wireless*. For the 5G wireless technology assessment (with key support from the National Academy of Sciences), GAO reported that new technologies will be needed to reach the full potential of 5G and noted several challenges, including that spectrum demand will likely continue to exceed supply and that 5G will exacerbate existing cybersecurity and privacy concerns.
- *Artificial Intelligence*. STAA partnered with the National Academy of Medicine to deliver a joint technology assessment focused on the use of Artificial Intelligence (AI) tools to augment patient care, the second in a three-part series on AI in health care.[1] GAO assessed both clinical and administrative AI tools and found that they show promise for improving health outcomes, reducing provider burden, and using health resources more efficiently. However, there are several challenges to developing and deploying these tools, including difficulties with obtaining sufficient high-quality data to create effective algorithms; challenges with scaling up and integrating these tools

[1]The first report in this series focused on the potential of Artificial Intelligence to expedite drug development (GAO-20-215SP; December 2019).

across different health care settings, such as rural vs. urban settings; and uncertainty over liability in the event of inaccurate results.

STAA also has additional technology assessments underway on topics including blockchain, AI in medical diagnostics, contact tracing apps, the use of forensic algorithms by law enforcement, quantum computing and communications, detection and remediation of per- and polyfluoroalkyl substances (PFAS) in drinking water, and technologies to provide military navigation capabilities in the absence of GPS. In addition, in FY 2021 STAA plans to begin technology assessments on topics including decarbonization technologies, forensic attribution of chemical weapons, gene editing and engineering, and the environmental and other effects of satellite constellations.

STAA also issued 17 Science & Tech Spotlights in 2020, on a broad range of topics, including nuclear microreactors, CRISPR gene editing, consumer electronics recycling, and deepfakes. Furthermore, STAA conducted numerous S&T-related performance audits on topics such as infectious disease modeling; antibiotic resistance; sexual harassment in science, technology, engineering, and mathematics ("STEM"); how the Patent and Trademark Office assists small businesses and inventors; and policies to address foreign influence in federal research. STAA also issued a new guide on best practices to assess the adoption and use of Agile software development and finalized a guide on using technology readiness assessments in complex technical acquisitions and projects such as the Navy's Columbia Class Nuclear Submarine program.

In addition to addressing numerous Committee or individual Member requests for on-demand technical assistance, we also provided services to Congress more broadly. In October, at the request of the House Committee on Administration, we hosted an S&T policy symposium for the House of Representatives to provide information to Members and staff on a range of topics, such as COVID-19, congressional modernization, and the innovation economy. The Committee included the symposium in the New Member Orientation Training that was provided to all incoming Representatives of the 117th Congress.

Another core area of STAA is the Innovation Lab, which aims to explore, pilot, and deploy new advanced analytic capabilities to enhance audit products. In 2020, the Lab initiated a first-of-its-kind collaborative effort across key agencies to enhance payment integrity. The Lab also implemented GAO's first advanced cloud infrastructure to support leading-edge development of data science prototypes, with the goal of

conducting GAO's work to more effectively support evidence-based policymaking. The Lab is developing a data literacy curriculum to use across the agency to enhance GAO's oversight work overall.

A final area of progress for STAA was further expansion of our network of S&T experts to increase the depth, breadth, and diversity of knowledge available to meet congressional needs. On October 15, 2020, we held our inaugural meeting of the newly established Polaris Council, a group of exceptional science, technology, and policy leaders and experts from many fields, to advise us on emerging S&T issues facing Congress and the nation. In addition, STAA participated in 210 external speaking events in 2020 to further broaden our expert networks.

To accomplish all of these contributions, STAA grew its S&T workforce in accordance with the plan provided to Congress in April 2019. At the beginning of fiscal year 2020, the STAA team included about 70 members, and as of January 2021 it was up to 104 members. These STAA staff have advanced degrees in a wide variety of fields, such as microbiology, quantum mechanics, public health, and chemical engineering.

Our FY 2022 request is based on our plans to continue and build on STAA's current pace of meeting congressional needs, and our plan to further grow STAA's staff. Our goals in doing so are to: 1) increase the number of technology assessments we conduct each year; 2) increase the number of short-to-medium turnaround products; 3) improve access to and absorption of our work through the use of a variety of digital publishing tools, such as online "dashboards;" and 4) pilot and deploy multiple advanced analytics prototypes to greatly enhance congressional oversight and support. For more details about the status of STAA's plans and ongoing efforts, see Appendix II.

Sustaining our Focus on Cybersecurity

Cyber threats can have a serious, or even potentially catastrophic, impact on federal systems, the nation's critical infrastructure, and the privacy and safety of the general public. Since 2010, we have made over 3,300 recommendations to federal agencies aimed at addressing cybersecurity challenges facing the government. More than 750 of the recommendations had not been fully implemented as of December 2020. Until these shortcomings are addressed, federal IT systems and data will be increasingly susceptible to cyber threats. In FY 2020, our work in this area resulted in numerous recommendations to help agencies address cyber threats. For example, we

- recommended ways to better oversee the National Cyber Strategy and highlighted the need to clearly define a central leadership role to coordinate government cybersecurity efforts;
- made 15 recommendations to four agencies to strengthen the cybersecurity of DHS's continuous diagnostics modernization program;[2]
- assessed the progress that FCC made in addressing 136 technical recommendations that we made to improve the agency's cybersecurity posture; and
- examined government-wide IT supply chain risks and made a total of 145 recommendations to 23 agencies, which were directly related to vulnerabilities that led to the SolarWinds intrusion (December 2020).

More recent high-profile and widespread cyberattacks on federal agencies and national infrastructure have further highlighted the urgent need to address the long-standing cybersecurity challenges facing the nation. For example, in December 2020 DHS's Cybersecurity and Infrastructure Security Agency (CISA) reported that an advanced persistent threat actor, likely of Russian origin, inserted a "backdoor" into a genuine version of a network management software product developed by SolarWinds.[3] The malicious actor used this backdoor, among other techniques, to initiate a cyberattack campaign against U.S. government agencies, critical infrastructure entities, and private-sector organizations that use the compromised network management software product. According to CISA, this threat poses a grave risk to the federal agencies and our nation's critical infrastructure, among others.[4]

Congress continues to turn to GAO for insightful analysis and advice to address these cybersecurity challenges. Moreover, it has shown strong

[2]The continuous diagnostics modernization program provides agencies with the tools that identify the hardware and software on their networks and check for vulnerabilities and insecure configurations.

[3]A "backdoor" is a malicious program that can potentially give an intruder remote access to an infected computer.

[4]Critical infrastructure includes systems and assets so vital to the United States that incapacitating or destroying them would have a debilitating effect on national security. These critical infrastructures are grouped by the following 16 industries or "sectors": chemical; commercial facilities; communications; critical manufacturing; dams; defense industrial base; emergency services; energy; financial services; food and agriculture; government facilities; health care and public health; information technology (IT); nuclear reactors, materials, and waste; transportation systems; and water and wastewater systems.

bicameral interest in learning more about the SolarWinds attack. Thus, recruiting top-tier cyber talent to augment our current audit workforce is critical. GAO plans to continue to recruit talent with specialized cybersecurity knowledge, skills, and expertise to augment our Information Technology and Cyber Security Team's capabilities, including within our Center for Enhanced Cybersecurity. This center is responsible for performing technical cybersecurity reviews, including vulnerability assessments and system configuration reviews of complex networks and systems.

Using our cadre of cybersecurity experts, we plan to continue our focus on four major challenges of our cyber High Risk area: (1) establishing a comprehensive cybersecurity strategy and performing effective oversight, (2) ensuring the security of federal information systems, (3) protecting cyber critical infrastructure, and (4) protecting privacy and sensitive data. Over the next 2 years, our planned efforts include assessing the

- federal response to the significant cyber incident, discovered in December 2020 and involving a supply chain compromise of the Solar Winds network management software, that was carried out against federal agencies and critical infrastructure entities;
- federal oversight, coordination, and implementation of the National Cyber Strategy;
- strategy for global cyberspace, such as global cybercrime and cyber diplomacy; and
- federal government's role in strengthening the nation's cybersecurity, including addressing ransomware activity.

Assisting Congress with Health Care Challenges

The COVID-19 pandemic has underscored the importance of effective administration and oversight of the federal government's health care programs and spending. In response to the pandemic, the government launched new programs and directed hundreds of billions of dollars to new and existing health care programs and providers.

In addition to our work on the pandemic, we continued to provide robust and timely analysis of other critical health care issues. In particular, in April 2020, we identified the federal government's efforts to address drug misuse as a high risk issue, noting at the time that this issue required immediate attention and action as the pandemic could further exacerbate the alarming drug misuse trends. In December 2020, CDC issued an alert indicating that provisional data show that drug overdoses have accelerated during the pandemic. We have ongoing work that will

continue to examine the effects of the pandemic on behavioral health, including substance abuse, as well as the federal government's funding for efforts to combat opioid misuse and abuse and the scheduling of fentanyl-related substances.

Last year we also shed light on important FDA oversight issues, including the agency's oversight of federal high-containment laboratories—those that conduct research on hazardous biological agents and operate under specific safety protocols—and overseas drug manufacturing. As of August 2020, nearly 60 percent of the 4,200 establishments that manufactured drugs for the U.S. market were located overseas. More than one-third of the foreign establishments supplying the U.S. market were in China and India. We testified before the Senate Committee on Finance on the challenges that FDA faces in trying to provide effective oversight of these establishments, and we continue this work to explore how these challenges can be addressed.

We have also continued to examine health care spending, which accounts for more than 25 percent of the federal budget. Putting the nation on a sustainable fiscal path requires that we better understand and restrain the growth in health care spending, including spending on prescription drugs. In January 2021, we issued a report that provides a comprehensive look at how drug prices compare across Medicare and VA and the drivers of the observed price differences. We also have forthcoming reports that examine prescription drug prices in the U.S. compared to those in other countries and how direct-to-consumer advertising may affect federal health care spending.

In FY 2021, we will also continue to examine the sustainability and integrity of the Medicare and Medicaid programs, which together accounted for over one trillion dollars in expenditures and an estimated $129 billion in improper payments in FY 2020. In addition to eroding public trust, the scope of improper payments in these programs jeopardizes the government's ability to provide care for those who most need it in the future. We have ongoing work examining how recent federal actions, such as the various telehealth and other flexibilities made available to providers, has affected the sustainability, administration, and integrity of the Medicare and Medicaid programs. In addition, we have ongoing work examining the efficiency of certain Medicare payment policy issues and how market structures, such as private equity ownership of nursing homes, affect the delivery of services.

Finally, we will continue to provide oversight of VA, DOD, and the Indian Health Service (IHS) health care services. For example

- In September 2020, we made recommendations to VA how it could improve the budget estimates for its community care program—through which a growing proportion of veterans are receiving care—to better inform decision-making and planning. Our report in February 2021 also exposed vulnerabilities in the credentialing and privileging processes for VA community care providers that could put veterans at risk, and we made recommendations to address this risk. We plan to continue to review different aspects of the care provided through this program, including the quality, timeliness, and cost-effectiveness.
- In October 2020, we issued a report that found VA's data on on-campus suicides were unreliable and recommended that VA improve this data, noting that such data are key to understanding and addressing this disturbing trend. We have ongoing work that further examines VA suicide prevention efforts as well as work examining DOD's efforts to prevent suicide among service members.
- In November 2020, we recommended that IHS address issues we found with lack of consistent, agency-wide oversight processes that resulted in limited and inconsistent oversight of health care facilities' decisions about the use of funds. We also have work planned or underway examining a range of quality of care issues at IHS, including how it determines current and projected health care needs, and the extent that IHS relies on outside providers for treatment of certain diseases.

Managing Our Internal Operations

In FY 2020, GAO again received an unmodified or "clean" opinion from independent auditors on our financial statements for FY 2020 and our internal control over financial reporting. There was no reportable noncompliance with provisions of applicable laws, regulations, contracts, and grant agreements tested. We demonstrated that all detailed performance and financial information is complete and reliable in order to achieve high standards for accuracy and transparency.

We also continued efforts to support our fourth strategic goal to maximize our value by enabling quality, timely service to the Congress and being a leading practices federal agency. We made progress addressing our three internal management challenges: managing a quality workforce; improving the efficiency of our engagements; and ensuring the confidentiality, integrity, and availability of GAO's information technology

services. With this budget request, we are planning to achieve and maintain 3,400 FTE in FY 2022.

In FY 2021 GAO completed deployment of our platform to edit, fact check and distribute our reports (New Blue). New Blue will streamline the publishing processes to enable efficient and scalable publication of products in a responsive web-based format to accommodate demand for content that is accessible on mobile devices. As such, Congressional staff and users on the go can quickly and easily navigate through our reports. GAO leveraged this platform for all our CARES Act bimonthly reports and will utilize it to republish previously issued products—thus making our key reports more accessible.

GAO's Information Technology Resources

GAO has made great strides in our IT modernization efforts. In fact, the work completed in FY 2019 and FY 2020 positioned the agency well for an immediate and smooth transition to maximum telework during the COVID-19 pandemic. Valuable operations to support auditing, evaluation, and investigative services for the Congress have continued without interruption. However, IT requires continued investment and nurturing to stay current, and even more to stay ahead of the ever-changing and evolving world of technology. I am confident this budget request keeps GAO on the right path.

For FY 2022, GAO is requesting funds to continue implementing efforts identified in our IT modernization plan to increase GAO's flexibility to evolve IT services as GAO mission needs change, strengthen information security, increase IT agility, and maintain compliance. We will increase speed and scalability to deliver capabilities and services to the agency, create a more predictable and consistent ISTS budget, and adhere to the GAO-adopted government Cloud Smart policy in planning for its enterprise IT architecture.

Major FY 2022 planned efforts

- *Cloud Smart Migration Plan*. GAO's Cloud Smart Migration Plan will help reduce our reliance on a physical IT infrastructure; reduce capital investment spending spikes; and increase flexibility to support business requirements more responsively. GAO will begin execution of multi-phased GAO Cloud Smart migration plan. The implementation of the migration plan will enable GAO to progressively move data center capabilities to the cloud such as virtual desktop infrastructure, databases, storage, failover, development / test environments, and other required computing resources.

- *Enterprise Content Management (ECM) Solution*. GAO will acquire and implement a cloud-based modern Enterprise Content Management (ECM) solution that will enable retirement of GAO's legacy document and records management system. The ECM system will also provide support for additional content types (e.g., multimedia), data encryption, workflow automation, enhanced search capabilities, and enable better content reuse.
- *Modern Devices and Hardware*. GAO staff rely on a variety of computer devices (e.g., towers, laptops, zero clients, and associated peripherals) to conduct work whether in-office, remote, or mobile. The vast majority of GAO computers are now several years well beyond their supported normal life cycle which causes problems with system reliability and performance. The FY 2022 request will allow GAO to put new devices into the hands of GAO staff so they have modern, secure, and reliable equipment to conduct GAO business.
- *New Blue enhancements*. GAO's New Blue solution enables digital distribution of audit reports in a mobile friendly web-based format that can be read on-line by any computer or mobile device. Additional funding will allow GAO to enhance New Blue to enable additional GAO product types, support for multi-media, and provide improved capabilities to enforce business rules and quality controls to the content creation process.
- *Enterprise Project Management Tools*. GAO staff execute thousands of projects a year. Additional use of automated tools is needed to improve project management practices. The FY 2022 requested funding level will enable GAO to continue to implement and expand the use of Enterprise Project Management Tools to help GAO staff plan and manage work in a more standardized manner.
- *IT Portfolio Management Solution*. GAO's largest funding category outside of personnel costs are for information technology. The current methods to plan, project, and track IT operations and investment costs are reliant on manual processes and disparate data sources. Requested funding supports investments in an automated portfolio management solution which automates processes and data management associated with IT portfolio management across the IT investment lifecycle.
- *Cybersecurity*. GAO must protect data collected from other agencies. Security threats are dynamic in nature and change quickly. GAO will use funding to enhance security monitoring for both on premise and cloud based assets through implementation of new tools, services, and enhanced processes.

- *Government-wide Shared Solutions*. GAO seeks to continue to add improved automated solutions to support its financial management functions. With the requested funding, GAO will be able to adopt Government Invoicing and integrated Asset Management solutions. The Treasury Department provides software to allow federal agencies to improve the quality and efficiency of intragovernmental billing and collection transactions via its G-invoicing software. This software replaces the current Inter Governmental Billing and Collections (IPAC) process and will be mandated for agencies. In addition GAO seeks to modernize its legacy asset management system with a modern asset management system integrated with the Momentum financial management system.

With these planned improvements we will enhance GAO's work agency-wide. GAO will execute transformative plans to protect data and systems while maximizing the use of cloud computing and minimizing risks associated with customized software. We will continually assess our technical architecture and services to identify opportunities for automating manual processes and reducing duplicative and outdated solutions, as well as leveraging more standard and government-wide shared solutions.

GAO's Facilities, Building, and Security

GAO's building and security services program includes funds to support the management of GAO-owned and leased facilities as well as the safety and security of occupants and visitors.

Budget constraints in recent years have necessitated the deferral of reinvestment in certain elements of our building's infrastructure and have prevented us from maximizing efficiencies. The requested increase will allow GAO to move forward with critical headquarters building initiatives that have been deferred over several years.

In FYs 2021 and 2022, GAO plans to:

- Begin a multi-year project to replace air handlers installed in the 1950s with new units that include HEPA filtration to filter out bacteria and many viruses, and UV light to prevent dangerous mold growth on cooling coils and potentially kill additional viruses. As the headquarters building of two federal agencies (GAO and the Army Corps of Engineers), and as a backup site for Congressional operations if Capitol Hill Buildings are shut down, it is critically important for government continuity of operations that the GAO Building have modern, safe air handling equipment that will protect GAO staff its tenants.

- Begin making critical repairs and/or replacements to end-of-life building systems. As identified in its FY 2020 financial statements, GAO has a growing backlog of deferred, but necessary, maintenance at its headquarters building, which currently totals over $82 million. GAO has begun a multi-year effort to reduce the backlog of maintenance to ensure the reliability and safety of the headquarters building for staff and tenants. In addition to multiple heating and air-conditioning projects, other initiatives include: the fourth floor consolidation; the STAA Innovation Lab; the parking garage structural study and design; and the asset management plan update.
- Continue work to relocate the Chicago field office into a federally-owned space. Work is underway to relocate the Huntsville field office to a permanent location, and the Dallas field office renovation will resume once the site is reopened post-pandemic. We are also working on identifying and planning relocation field sites for Atlanta, Los Angeles, Norfolk, and Seattle.

During FY 2021, GAO will also continue to implement recommendations from the agency-wide security risk assessment that was completed in FY 2018, to include the completion of the electronic security system installations in Seattle, Chicago, and Huntsville as well as continue upgrading the system at the headquarters building. GAO also plans to replace its aging security radio system to better ensure effective operations and compatibility with other agencies.

GAO continues to receive an increasing number of statutory mandates and congressional requests that result in engagements that rely heavily on classified and sensitive information. To that end, in FY 2021 GAO will continue to evaluate and enhance the resources available to staff who are responsible for conducting these audits. GAO will begin the construction of several Secure Video Teleconference (S-VTC) rooms at strategically chosen GAO field offices. These S-VTCs will enhance the ability of field and HQ staff to collaborate securely across multiple GAO locations as well as with other federal agencies.

Legal Work Update

Our Office of the General Counsel (OGC) handled over 2,100 bid protests and issued more than 500 decisions on the merits. With respect to our appropriations law function, in testimony before the House Committee on the Budget, the General Counsel explained how our role in providing information and legal analysis on appropriations law matters ensures respect for the Congress's constitutional power of the purse, and discussed legislative proposals that would help us continue to advance and protect such power. Following this testimony, we continued to

demonstrate how we protect the Congress's constitutional prerogatives by notifying the Congress of four violations of the Anti-deficiency Act for which the agencies failed to make the legally required report. We also issued a number of decisions addressing significant, novel legal issues arising from federal agencies' use of appropriated funds during the partial government shutdown that occurred in FY 2019.

During FY 2019 and FY 2020, OGC increased the number of attorneys assigned to the appropriations law team as encouraged by Congress, and this effort is continuing in FY 2021. The additional funding requested for FY 2022 will allow GAO to further enhance the resources allocated to its important appropriations law functions.

Strategic Planning

As the nation confronts a series of both new and long-standing challenges, GAO's Strategic Plan for Serving the Congress and the Nation – FYs 2018 to 2023 describes our goals and strategies to support the Congress to identify cost savings and other financial opportunities; to make government more accountable, efficient and effective; and ultimately to improve the safety, security, and well-being of the American people. GAO's Strategic Plan provides a comprehensive roadmap for how the agency will support the most important priorities of Congress and the Nation.

This plan reflects the full scope of the federal government's operations, as well as emerging and future trends that may affect government and society. As part of our strategic planning process, we emphasize foresight, continuous environmental scanning, and trend analysis as essential to helping inform our decision-making and long-term planning.

The plan is comprised of three sections: strategic goals and objectives; key efforts; and trends that provide overall context supporting our long-range planning. There are eight trend areas in GAO's 2018 – 2023 plan including

1. Domestic and Global Security: Global conditions affecting U.S. and international security;
2. Fiscal Outlook and the Debt: The federal government's long-term unsustainable fiscal path;
3. Economics and Trade: Global response to challenges posed by divergent economic growth;

4. Jobs and Education: Technological advances and their impact on preparing the workforce of the future;
5. Demographics and Society: Demographic changes and their implications for U.S. society and economy;
6. Science and Technology: Five emerging technologies and scientific advances that could potentially transform society (Genome Editing; Artificial Intelligence and Automation; Quantum Information Science; Brain/Augmented Reality; and Cryptocurrencies and Blockchain);
7. Government and Governance: Increasingly complex governance relationships and practices; and
8. Environment and Sustainability: Balancing competing natural resource and sustainability needs.

The current strategic plan framework (Appendix III) summarizes these global trends affecting government and society, as well as the strategic goals and objectives that guide our work. We plan to issue an updated GAO strategic framework in FY 2022.

Center for Audit Excellence

The Consolidated and Further Continuing Appropriations Act, 2015, enacted in December 2014, authorized GAO to establish a Center for Audit Excellence (CAE) to build institutional auditing capacity and promote good governance by providing training and assistance to federal, state, local and other national audit offices around the world. The Center uses former senior-level GAO executives and auditors on an intermittent basis to provide a wide range of training and technical assistance services to audit organizations and is authorized to charge fees for its services which are used to offset Center operating costs.

In FY 2020, despite the impact of the global pandemic which curtailed travel and in-person training classes for the last half of the year, the Center collected more than $800 thousand in fees and provided technical assistance or training to 11 domestic accountability organizations and audit organizations in six countries. The Center has reached nearly every region of the world—providing custom training courses, mentorship and coaching, institutional capacity building, and needs assessments.

Moving forward the Center seeks to bolster its operations as demand for its services continues to expand, particularly with international organizations. Building the capacity of National Audit Organizations across the globe helps produce high-quality auditing functions which can improve oversight of U.S. foreign assistance and hold governments

accountable for using public funds efficiently and effectively and deterring and identifying corruption.

Following the onset of the pandemic, the Center began offering virtual training classes in lieu of in-person classes. In FY 2021 and FY 2022, the Center plans to significantly expand the number of virtual training classes. This initiative will enable the Center to offer domestic and international organizations a range of service delivery options during and beyond the pandemic.

Examples of Working with International Organizations

- Currently, with USAID support, the Center is helping to improve the capacity of national audit institutions in five countries including the Philippines, Dominican Republic, Ethiopia, Armenia and Georgia. For example, the Center is helping to enhance the Philippine national audit office's capacity to conduct performance audits via a multi-year $1.5 million agreement. The Center will also be providing training and technical assistance services to audit organizations in Ethiopia and Armenia under multi-year agreements valued at $1.3 million and $1 million, respectively.
- With World Bank support, the Center is helping to conduct a capacity building needs assessment of a national audit organization in Europe.

Examples of Working with Domestic Organizations

- The Center continues to provide high quality training to federal inspectors general as well as multiple state and local audit organizations.
- The Center recently acquired an online registration system and the capability to offer virtual classes for federal, state and local auditors using a software platform.

Concluding Remarks

We value the opportunity to provide Congress and the nation with timely, insightful analysis on the challenges facing the country. Our FY 2022 budget request provides a foundation to ensure that GAO is well-positioned and prepared to address both emerging and long-term priorities of the Congress.

Our request will allow us to continue building our staffing level for critical audit arenas and provide our people with the appropriate resources and support needed to serve the Congress effectively. This funding level will also allow us to continue efforts to promote operational efficiency and

address long-deferred investments and maintenance. Also of great importance, our proposed FY 2022 budget helps us ensure the health and safety of all GAO employees while they work on GAO premises.

As is our standard practice, we will continue to explore opportunities to generate revenue to help offset our costs.

I appreciate, as always, your careful consideration of our budget and your continued support. I look forward to discussing our FY 2022 budget request with you.

Appendix I: GAO's High Risk List as of April 2021

GAO's 2021 High-Risk List

Strengthening the Foundation for Efficiency and Effectiveness

- Strategic Human Capital Management
- Managing Federal Real Property
- Funding the Nation's Surface Transportation System[a]
- Modernizing the U.S. Financial Regulatory System[a]
- Resolving the Federal Role in Housing Finance[a]
- USPS Financial Viability[a]
- Management of Federal Oil and Gas Resources
- Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks[a]
- Improving the Management of IT Acquisitions and Operations
- Improving Federal Management of Programs That Serve Tribes and Their Members
- Decennial Census
- U.S. Government's Environmental Liability[a]
- Emergency Loans for Small Businesses (***new***)

Transforming DOD Program Management

- DOD Weapon Systems Acquisition
- DOD Financial Management
- DOD Business Systems Modernization
- DOD Approach to Business Transformation

Ensuring Public Safety and Security

- Government-wide Personnel Security Clearance Process[a]
- Ensuring the Cybersecurity of the Nation[a]
- Strengthening Department of Homeland Security Management Functions
- Ensuring the Effective Protection of Technologies Critical to U.S. National Security Interests
- Improving Federal Oversight of Food Safety[a]
- Protecting Public Health through Enhanced Oversight of Medical Products
- Transforming EPA's Process for Assessing and Controlling Toxic Chemicals
- National Efforts to Prevent, Respond to, and Recover from Drug Misuse (***new***)

Managing Federal Contracting More Effectively

- VA Acquisition Management
- DOE's Contract and Project Management for the National Nuclear Security Administration and Office of Environmental Management
- NASA Acquisition Management
- DOD Contract Management

Assessing the Efficiency and Effectiveness of Tax Law Administration

- Enforcement of Tax Laws[a]

Modernizing and Safeguarding Insurance and Benefit Programs

- Medicare Program & Improper Payments
- Strengthening Medicaid Program Integrity[a]
- Improving and Modernizing Federal Disability Programs
- Pension Benefit Guaranty Corporation Insurance Programs[a]
- National Flood Insurance Program[a]
- Managing Risks and Improving VA Health Care[a]

Source: GAO 21 119SP. | GAO 21 510T

[a]Legislation is likely to be necessary in order to effectively address this area.

Appendix II: GAO's Science, Technology Assessment, and Analytics Team: Progress and Ability to Address Congress' Needs

The United States Government Accountability Office (GAO) established the Science, Technology Assessment, and Analytics (STAA) team in January 2019, as encouraged by Congress.[1] The joint explanatory statement accompanying the Consolidated Appropriations Act, 2021, acknowledged the progress GAO has made since establishing the team and submitting a plan to Congress for expanding the team over time.[2] This report provides an update on GAO's progress in implementing that plan in support of Congress. It also responds to the provision in that statement that GAO provide an analysis of GAO's protocols used by STAA and our abilities to address technology assessment requests from Congress.

Rapid developments in science and technology (S&T) are transforming virtually every sector of society, including medicine, transportation, communication, defense, commerce, and culture. Like all technological change, each of these developments brings opportunities—for economic growth and improved quality of life, for example—and the potential for unintended consequences. The ability of Congress to understand and prepare for such changes will be critical for the United States to remain safe, secure, innovative, and globally competitive. Congress has continued to invest in STAA because of a bipartisan recognition that science, technology, and innovation challenges require increased focus.

GAO provides Members of Congress and their staffs with an array of professional services in the domains of foresight, insight, and oversight to help them carry out their constitutional responsibilities as they relate to the nation's S&T enterprise. Our expertise, research, and analyses help address a number of specific congressional needs, including:

- in-depth evaluation and oversight of federal S&T programs;
- foresight on new and emerging technologies;
- evaluation of the effects and policy implications of science, technology, and innovation on society;
- innovation to support evidence-based policymaking through data analytics;
- exploration of emerging technologies and support for congressional modernization efforts;

[1]H.R. Rep. No. 115-929, at 213 (2018) (Conf. Rep.) (encouraging GAO to reorganize its technology and science function by creating a new, more prominent office within GAO).

[2]166 Cong. Rec. 8720 (Dec. 21, 2020) (joint explanatory statement).

- development of policy options that may help policymakers enhance the benefits and mitigate the challenges of technologies; and
- proactive and on-demand technical assistance on science, technology, and innovation issues.

GAO continues to successfully conduct S&T-related work, providing Members of Congress and their staffs with a variety of products and services. This includes issuing specialized reports known as technology assessments. By continuing to build our expertise and focus on S&T, we will be even better positioned to help Congress navigate the increasingly complex technologies it must oversee, including rapid vaccine development, artificial intelligence (AI), and quantum computing.

Since the launch of STAA in January 2019, GAO has significantly increased its resources—including staff—to produce a growing volume of accessible, timely, and relevant S&T information, across a broader range of topics. We have organized our S&T activities into four groups, as is shown in figure 1.

Figure 1: Science, Technology Assessment, and Analytics Key Science and Technology Activities

Source: GAO. | GAO-21-510T

Further expanding STAA's capabilities and resources would provide extensive S&T foresight, insight, and oversight to an increasing array of committees and Members at an unprecedented time in our nation's history, as our nation faces both significant challenges and opportunities. Since we issued our plan, the National Academy of Public Administration (NAPA) also issued a report to Congress that recommended that an enhanced STAA become the locus for studies and analyses that are critical for congressional committees to conduct business, including technology assessments and short-to-medium term studies. It included several recommendations regarding GAO's support for Congress. We also provide information on GAO's actions related to those recommendations below.

Variety of Means to Address Congressional Needs

We employ a variety of approaches that can be tailored to meet congressional needs. Examples include technology assessments, Science & Tech Spotlights, technical assistance, performance audits, and outreach. As such, we have been and will continue to be innovative in addressing congressional needs.

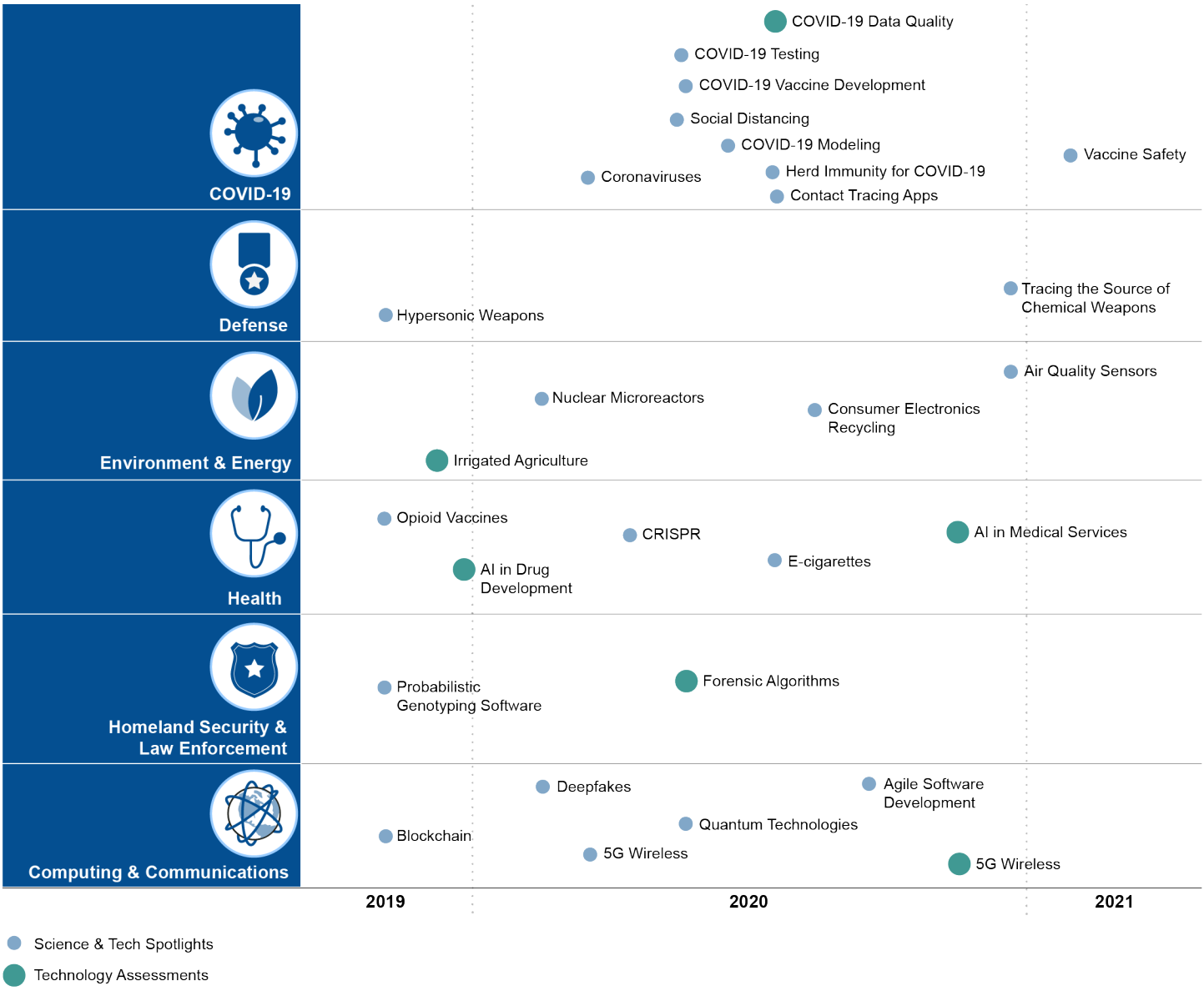
Technology assessments. GAO technology assessments analyze the latest developments in science and technology, draw attention to the implications of technological change, and provide options policymakers could consider to help enhance or mitigate the challenges of a technology. They may highlight potential short-, medium-, and long-term impacts of scientific advancement and/or technological development; elaborate on and communicate the risks and benefits associated with a technology, including early insights into the potential impacts of technology; or highlight the status, viability, and relative maturity of a given technology—especially in the context of a complex acquisition program. Technology assessment timeframes depend on their scope, but some can be completed in several months.

Science & Tech Spotlights. We also provide Congress with information about emerging topics through our Science & Tech Spotlights. Spotlights are two-page overviews or explainers of scientific or technological topics for policymakers and the public. We launched Spotlights in 2019 in direct response to conversations with Members of Congress who expressed interest in short, quick turnaround information on emerging issues. Each Spotlight describes an emerging S&T development, the opportunities and challenges it brings, and the relevant policy context. Spotlights inform Congress of key developments in a timely and efficient manner, generally

before congressional requests for deeper inquiries. It takes about one month to issue a Spotlight.

We have issued technology assessments and Science & Tech Spotlights on a wide variety of topics since we were established in 2019, as is shown in figure 2. (A complete list of our Spotlights is included at the end of this appendix.)

Figure 2: GAO's Issued Technology Assessments and Science & Tech Spotlights Since Establishment of the Science, Technology Assessment, and Analytics Team



Source: GAO. | GAO-21-510T

Technical assistance. We frequently provide technical assistance to individual Members to meet quick-turnaround needs. Technical assistance is a service that GAO provides to any committee or individual

Member of Congress. For example, we provide briefings on our prior work; short-term analyses; technology primers; and support for hearings, including background information and potential questions. We quickly answer many highly technical questions from an array of committees and Members, thanks to our broad mix of expertise. We provided technical assistance to Congress related to COVID-19 on at least 20 occasions from March to December 2020. For example, to answer a question about how textiles perform in face masks, we assembled a team of GAO staff including an experienced clinician, a microbiologist, a biomedical engineer, and a geneticist. Their combined knowledge allowed them to quickly comb the existing scientific literature, evaluate studies, and draw conclusions.

In addition to pandemic-related assistance, we provided technical assistance on several other topics. For example, we provided a detailed analysis of selected technical approaches to how the House of Representatives could carry out its business during the COVID-19 pandemic.

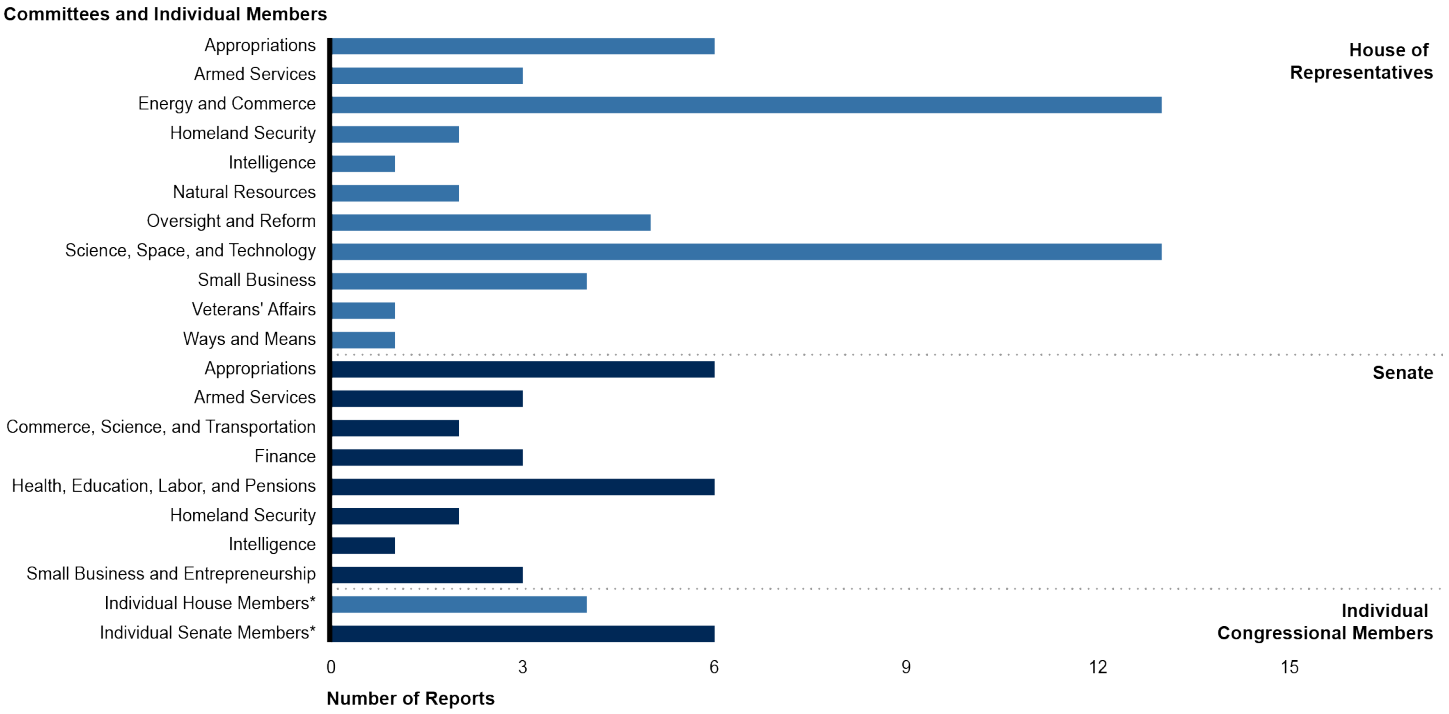
Performance audits. When Congress needs to better understand the operations of S&T focused agencies, programs, or projects, we meet their needs through performance audits. These evaluations can include reviews that assess efforts across numerous agencies or may address just one project at a given agency. Depending on the topic and scope, timeframes can range from six months to over a year.

Outreach. The Comptroller General regularly meets with committee leaders and discusses their interest in GAO's work, including STAA's work. STAA's executives also regularly engage with key committees to understand their oversight and legislative agendas and how GAO can help.

For example, in October 2020, at the request of the House Committee on Administration, we hosted an S&T policy symposium for the House of Representatives to provide information to Members and staff on a range of topics, such as COVID-19, 5G wireless technology, congressional modernization, and the innovation economy. The committee included the symposium in the New Member Orientation Training that was provided to all incoming Representatives of the 117th Congress. We plan to expand such outreach in the future.

We are committed to continuing our support for a wide range of committees and individual members and to expanding how we do so. Figure 3 shows our 2020 client base for reports.

Figure 3: Since Establishment in 2019, GAO's Science, Technology Assessment, and Analytics Team Has Conducted Work for Many Committees and Members of Congress



*Our protocols allow individual members to initiate congressional requests

Source: GAO. | GAO-21-510T

STAA Accomplishments

Since establishing STAA in 2019, we have completed extensive work on a wide range of topics of interest to Congress. We have issued 55 reports on a range of important S&T topics, and we have more than 20 additional studies underway. We also recently issued a Technology Assessment Design Handbook (GAO-21-347G), which offers tools for designing assessments of a technology's effects that make complex issues understandable and useful to policymakers. To develop the handbook, we reviewed numerous GAO technology assessments, Office of Technology Assessment reports, Congressional Research Service reports, and literature regarding technology assessments and analysis of policy options. We held an expert meeting to gather input regarding technology assessment design, solicited comments from external experts, issued an exposure draft to the public for comment, and incorporated comments from those sources as appropriate.

Furthermore, we have expanded STAA's capacity in conducting evidence-based analytics, making recommendations, and delivering on-demand, quick-turnaround reporting. Our expanded issuance of Spotlights, development of some shorter turnaround technology assessments, inclusion of policy options in technology assessments where appropriate, establishment of a working group to develop new types of products, and increased networking to enhance networks with the S&T community all help address NAPA recommendations. We describe our accomplishments below.

COVID-19 Work

The COVID-19 pandemic illustrates the central role of S&T and the benefits of a greater focus on the subject. Even before the full scope of the pandemic emerged, we began to shift some of our resources to address it. For example, we issued a Science & Tech Spotlight on coronaviruses in early March 2020, providing a high-level overview of what they are and how they are transmitted. We followed this with six additional Spotlights on COVID-19 topics, including social distancing, testing, contact tracing apps, and herd immunity. STAA staff also contributed significant S&T expertise to the five CARES Act reports GAO issued between June 2020 and January 2021. These reports focus on efforts across the government to address the pandemic.[3]

STAA has played an important role in GAO's oversight of the federal response to the COVID-19 pandemic. Throughout the pandemic, STAA has provided congressional committees and individual Members with technical assistance—support provided directly to the congressional requester that does not result in a public product—on COVID-19 on numerous occasions. This included topics such as: how well face mask materials filter droplets and aerosols, differences among three prominent COVID-19 models, and the effectiveness of certain filtration systems in reducing respiratory disease transmission on airplanes.

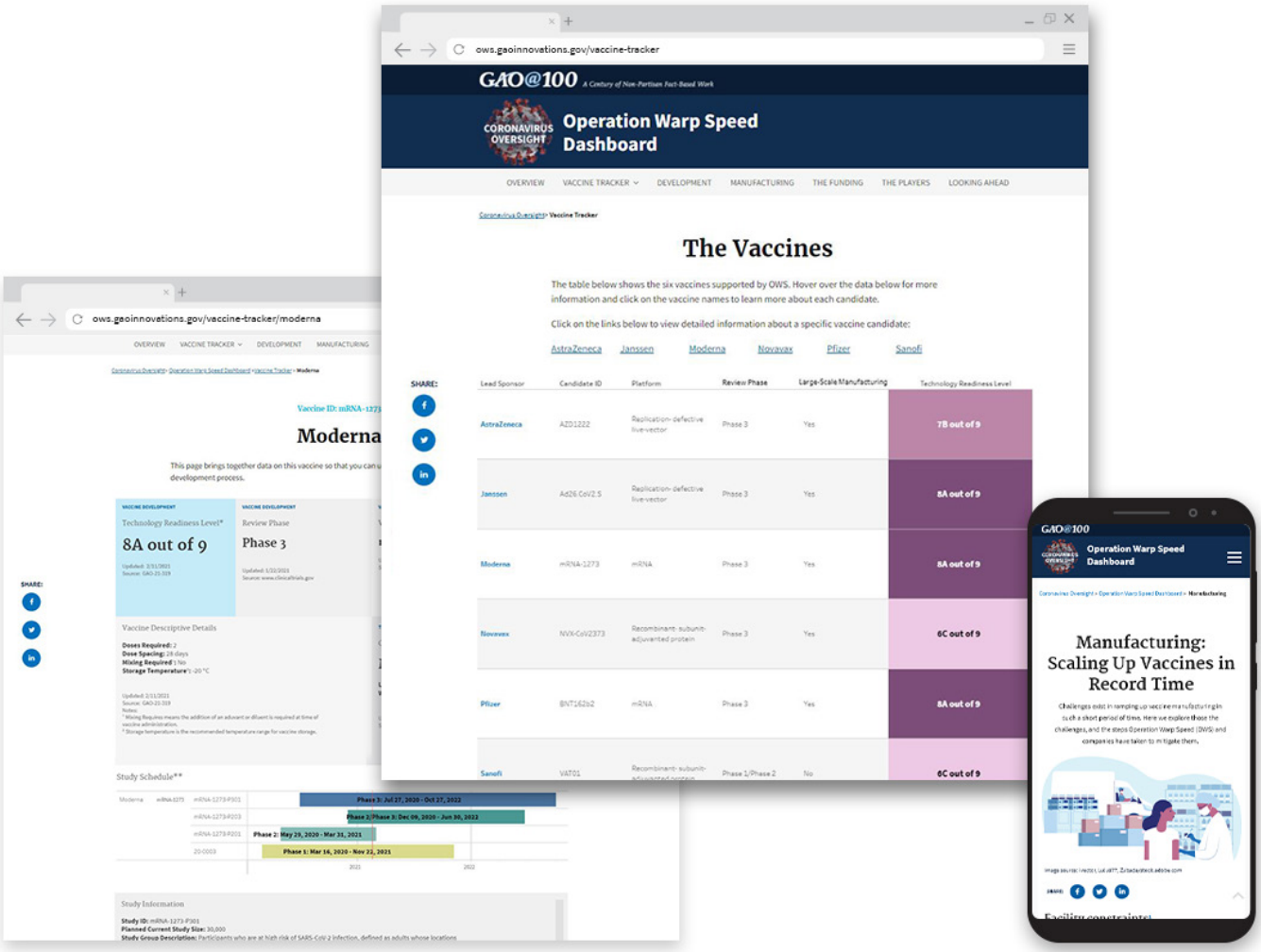
STAA analyzed four COVID-19 vaccine developers' clinical trial protocols and reported in November on information the trials will provide and their limitations. In February, we issued a Spotlight on vaccine safety and released GAO's first-of-its-kind interactive and updated in real-time digital dashboard with a companion full report on Operation Warp Speed (OWS)

[3]As of January 31, 2021, in response to the COVID-19 pandemic, Congress appropriated about $3.1 trillion in emergency assistance for people, businesses, the health care system, and state and local governments. GAO is examining many aspects of the federal response. The CARES Act requires GAO to issue bi-monthly reports on the impact of COVID-19.

vaccine development and manufacturing (see fig. 4).[4] We also briefed Members of the House Select Subcommittee on the Coronavirus Crisis on the oversight dashboard. This included highlighting key interactive features, such as the ability to easily view complex and dynamic information, including the current maturity of the vaccine candidates, the latest clinical trials information for each vaccine, a listing of key OWS leadership, a snapshot of OWS funding obligations, key issues in vaccine manufacturing, and lessons learned from the 2009 pandemic that are relevant to our current situation. These Members indicated their intent to refer back to this dashboard to support real-time oversight of OWS.

[4]See https://ows.gaoinnovations.gov for GAO's dashboard providing key information on Operation Warp Speed COVID-19 vaccine development and manufacturing.

Figure 4: Science, Technology Assessment, and Analytics Dashboard Provides Key Information on Operation Warp Speed Supported COVID-19 Vaccines



Source: GAO. | GAO-21-510T

Our ongoing work includes continued review of vaccine manufacturing and a technology assessment on contact tracing. Table 1 highlights some of our recent COVID-19-related work.

Table 1: Science, Technology Assessment, and Analytics COVID-19-Related Reports

Operation Warp Speed: Accelerated COVID-19 Vaccine Development Status and Efforts to Address Manufacturing Challenges (GAO-21-319)	This technical audit found that Operation Warp Speed (OWS) vaccine developers generally followed traditional vaccine development processes, with some adaptations to meet urgent needs of the pandemic. It also found that agencies have taken steps to mitigate vaccine manufacturing challenges, such as requiring contractors to prioritize supplies for vaccine manufacturing.
COVID-19: Federal Efforts Accelerate Vaccine and Therapeutic Development, but More Transparency Needed on Emergency Use Authorizations (GAO-21-207)	This performance audit examined OWS's efforts to accelerate the development of vaccines and therapeutics for COVID-19. It provided an overview of the six vaccine candidates supported by OWS, including information about the biological mechanisms of the vaccine platforms. We assessed the clinical trial protocols that four OWS vaccine developers released, including details about how they compared with typical clinical trials for vaccines.
Covid-19: Data Quality and Considerations for Modeling and Analysis (GAO-20-635SP)	This technology assessment found that forecasting models can help predict disease trends, such as infection or mortality rates for COVID-19, but that they rely on data collected by different jurisdictions and reported under different standards. This reliance makes it harder to compare data across places and over time. This TA aimed to help decision-makers understand the appropriate uses and limitations of modeling.
Infectious Disease Modeling: Opportunities to Improve Coordination and Ensure Reproducibility (GAO-20-372)	This technical audit reviews federal modeling for selected infectious diseases. Outbreaks of infectious diseases have raised concerns about how federal agencies use modeling to predict a disease's course. Models can help decision makers set disease control policies. If models are unsound, they may not produce the reliable predictions needed to make good decisions. GAO made two recommendations to Health and Human Services (HHS), including developing a way to routinely monitor modeling coordination efforts across multiple agencies. HHS agreed with GAO's recommendations.
Contact Tracing Applications (ongoing)	This technology assessment will describe existing exposure notification application technologies and the extent of deployment of these apps in the United States. It will assess challenges associated with developing, deploying, and using exposure notification apps. In addition, it will also identify policy options that could address the challenges to the development, deployment, and use of exposure notification application technologies.
Vaccine Safety (GAO-21-342SP)	This Spotlight describes the circumstances under which a vaccine is generally considered safe and explains that common side effects that stem from the body's immune reaction, such as swelling at the injection site, fever, and aches, are to be expected. Among other things, it describes the safety evaluation process for vaccines.
Contact Tracing Apps (GAO-20-666SP)	This Spotlight explains what contact tracing is, how the process works, and how applications facilitate it. It includes information about the organizations and technologies involved with contact tracing. It describes opportunities to reach more people through these applications as well as challenges related to areas such as interoperability and adoption.
Herd Immunity for COVID-19 (GAO-20-646SP)	This Spotlight explains that herd immunity is when a large enough portion of a population—typically 70 to 90 percent—develops immunity to a disease. It includes information about how herd immunity develops—through either infection or vaccination. It lays out some of the challenges related to understanding herd immunity for COVID-19, such as limited data on immunity.
COVID-19 Modeling (GAO-20-582SP)	This Spotlight explains the uses and limitations of infectious disease modeling. It discusses different types of models, including mechanistic, susceptible-exposed-infectious-recovered, statistical, and combined models. It points out that each model has a distinct purpose that must be considered when interpreting its results.

COVID-19 Vaccine Development (GAO-20-583SP)	This Spotlight describes the vaccine development process and what the federal government's plans were to develop COVID-19 vaccines. It walks through clinical trials processes. It explains the biological mechanisms of the three vaccine platforms supported by OWS.
COVID-19 Testing (GAO-20-584SP)	This Spotlight explains the different types of tests that were available for COVID-19 testing: molecular, antigen, and serology. It describes how the tests are administered, the technologies involved, and the maturity of the tests. It lays out the benefits and limitations of COVID-19 testing.
Social Distancing During Pandemics (GAO-20-545SP)	This Spotlight explains the science behind social distancing and that it can be used as a tool to reduce disease transmission as vaccines and treatments are developed. It raises policy questions, such as what research is needed to better establish the scientific basis of disease transmission so that effective methods for social distancing can be devised and promulgated.
Coronaviruses (GAO-20-472SP)	Issued on March 3, 2020, this Spotlight provided early information on what coronaviruses are, how they are transmitted, and how they work biologically.

Source: GAO. | GAO 21 510T

Advanced Technologies

We expanded our work on advanced technologies to help Congress navigate the rapid technological changes we are experiencing today. Some of this work reflects the ongoing evolution of our technology assessments to better meet congressional needs. For example:

- We now include policy options in our technology assessments, as appropriate. The policy options are designed to inform decision makers on potential courses of action to help enhance benefits and mitigate challenges associated with advanced technologies.
- **Use of AI in Medicine**. We have been partnering with the National Academy of Medicine (NAM) on a series of joint technology assessments on the use of AI in health care, including reports on AI in drug development, in health care services, and in diagnostics (ongoing). Each report in this three-part series includes a full GAO technology assessment plus a section from NAM. The collaboration also features joint webinars to discuss the results of each report; to date, these webinars have drawn over 600 attendees each.
- **Forensic Algorithms**. To address congressional interest in both quick-turnaround and in-depth work on forensic algorithms, we split planned work into two reports. The first was a quick-turnaround technology assessment that provided an overview of the algorithms in use by federal law enforcement. The second includes a more in-depth analysis of the performance of such algorithms, and is scheduled to issue this spring.

We include examples of recent work on advanced technologies in table 2.

Table 2: Selected Science, Technology Assessment, and Analytics Reports on Advanced Technologies

5G Wireless: Capabilities and Challenges for an Evolving Network (GAO-21-26SP)	This technology assessment reported on fifth-generation (5G) wireless's promise to increase speeds and new applications, like automated cars and smart factories. We found that new technologies will be needed to reach the full potential of 5G and noted several challenges, including that spectrum demand will likely continue to exceed supply and that 5G will exacerbate existing privacy concerns and may introduce new cybersecurity risks. We developed six policy options related to areas such as spectrum-sharing technologies, cybersecurity requirements, and high-band research.
Artificial Intelligence in Health Care: Benefits and Challenges of Technologies to Augment Patient Care (GAO-21-7SP)	This is second technology assessment of the Artificial Intelligence (AI) in Health Care series, which was developed in partnership with the National Academy of Medicine. It assessed clinical and administrative AI tools. We found that the tools show promise for improving health outcomes, reducing provider burden, and using health resources more efficiently. Challenges include obtaining sufficient high-quality data, difficulties scaling up and integrating these tools across different health care settings, and uncertainty over liability in the event of inaccurate results. We developed six policy options related to areas such as collaboration, best practices, and oversight clarity.
Quantum Technologies (GAO-20-527SP)	This Spotlight explains what quantum technologies are, how they work, potential applications, and more. These technologies could revolutionize sensors, computation, and communication. They build on the study of the smallest particles of energy and matter to collect, generate, and process information in ways existing technologies cannot. The Spotlight also poses questions about topics such as workforce needs and national security concerns.
Forensic Technology: Algorithms Used in Federal Law Enforcement (GAO-20-479SP)	This technology assessment examined forensic algorithms, which help forensic experts partially automate the process of assessing whether or not evidence collected in an investigation may have originated from an individual, potentially increasing the speed of investigations and reducing human bias and error. We reviewed three main types of algorithms federal agencies use: face recognition, probabilistic genotyping, and latent print analysis.
Artificial Intelligence in Health Care: Benefits and Challenges of Machine Learning in Drug Development (GAO-20-215SP)	This is the first technology assessment in the AI in Health Care series. We found that machine learning is used throughout the drug development process and could increase its efficiency and effectiveness, decreasing the time and cost required to bring new drugs to market. We identified several challenges that hinder the adoption and impact of machine learning in drug development and developed six policy options to help address them, related to topics such as research, data access, and regulatory certainty.
Irrigated Agriculture: Technologies, Practices, and Implications for Water Scarcity (GAO-20-128SP)	This technology assessment provides an overview of irrigation technologies and on-farm water conservation practices that farmers can use to increase efficient use of water. For example, precision agriculture technologies, such as smartphone decision-support tools and remote control of irrigation equipment can help optimize irrigation scheduling. We also examined factors influencing the adoption of these technologies and implications of their use. We identified policy options related to promotion of more efficient irrigation and use of precision agriculture technologies.
Alternative Positioning, Navigation, and Timing (ongoing)	This technology assessment looks at the Department of Defense's development of alternative navigation technologies that could support DOD missions if GPS is unavailable or unreliable. While GPS will remain a key part of DOD's navigation solution, we describe several alternative technologies that can complement GPS when needed, along with some challenges DOD faces in developing and integrating alternative navigation technologies and six policy options that could address those challenges.

Forensic Algorithms II (ongoing)	This is the second part of the Forensic Algorithms technology assessment series. We are focusing on the algorithms identified in part 1 (above), for their use in criminal investigations. This work examines the metrics used to assess the performance of three key algorithms identified in part 1 (above), the strengths and challenges of these algorithms, and policy options to address such challenges.
Artificial Intelligence in Diagnostics (ongoing)	This is the third in the Artificial Intelligence (AI) in Health Care series of technology assessments. This part, also developed in partnership with the National Academy of Medicine, is examining the use of AI in medical diagnostics. Specifically, we are examining the use and potential of such technologies for diagnosing diseases such as cancer, Alzheimer's, and heart disease. We are also identifying challenges to development and adoption of such technologies, and policy options that could address such challenges
Quantum Information Technologies (ongoing)	This technology assessment is reviewing: potential applications of quantum computing and communications technologies; their maturity; potential benefits and drawbacks from their development and use; and factors that could affect their development and use. We will also develop policy options to address those factors, enhance benefits, and mitigate drawbacks.
Blockchain and Other Digital Ledger Technologies (ongoing)	This technology assessment examines blockchain technology, which can be used to record and track data over distributed synchronous ledgers. Specifically, we are examining the use and potential benefits of such technologies for financial applications such as stablecoins and Decentralized Finance, and in other areas such as supply chain management. We are also identifying challenges to development and adoption of such technologies, and policy options that could mitigate such challenges or enhance the technology's benefits.

Source: GAO. | GAO 21 510T

We also plan to further expand the variety of topics we address. For example, we plan to conduct technology assessments on the following topics to meet congressional demand: decarbonization technologies, forensic attribution of chemical weapons, regenerative medicine/3D bioprinting, AI in environmental modeling, hypersonic weapons, per- and polyfluoroalkyl substances (PFAS), and the environmental and other effects of satellite constellations. We also anticipate developing Spotlights on urban air mobility, gene editing and engineering, DNA and glass for data storage, utility-scale energy storage, innovations in plastics recycling, and the blue economy.

Improving Management of Federal S&T Programs

We continue to issue reports and guidance to federal managers and employees to help S&T-intensive programs operate at their best. One way we do this is through crosscutting work that evaluates the management and coordination of research and development across the federal government. This work addresses issues related to topics such as basic science, innovation, manufacturing, and S&T's role in economic competitiveness. In fiscal year 2020 alone, we made 73 recommendations to federal agencies through this body of work. They aimed to, among other things, improve public access to federally funded research results, address sexual harassment in STEM research, and

improve assistance to small businesses and inventors regarding intellectual property. We include additional examples in table 3 below.

Table 3: Science, Technology Assessment, and Analytics Reports on Science and Technology in the Federal Government

Federal Research Grants: OMB Should Take Steps to Establish the Research Policy Board (GAO-21-232R)	Federal research funding is key for advancing science and innovation. But federal funding comes with administrative requirements—e.g., documentation and reporting—that allow for oversight. Are those requirements getting in the way of research? The Office of Management and Budget could find out. However, it has not done so and authority for the board ends on Sept. 30, 2021. We recommended the Director of OMB establish the Research Policy Board.
Department of Energy: Improved Performance Planning Could Strengthen Technology Transfer (GAO-21-202)	A Department of Energy national laboratory developed a battery that now powers some hybrid and electric cars. But how do new energy technologies get from the lab to the market? Transferring technologies from the DOE to private companies isn't always easy. GAO recommended that DOE assess researchers' needs for commercialization training and develop performance goals. DOE concurred with the recommendations.
Small Business Innovation Research: Three Agencies Made Awards to Businesses Majority-Owned by Investment Companies and Funds (GAO-21-223R)	The Small Business Innovation Research Program seeks to stimulate technological breakthroughs by channeling federal research and development funds to small businesses. Since 2013, small businesses owned by venture capital companies, hedge funds, or private equity firms may participate in some cases. The reasons agencies cited for making the awards included a belief that they would prompt research in areas that have not drawn private investment.
Federal Research: Agencies Need to Enhance Policies to Address Foreign Influence (GAO-21-130)	This review examined federal agencies' conflict of interest policies and disclosure of foreign interest requirements, which aim to protect U.S. investments in scientific research from undue foreign influence. Two of the 5 agencies we reviewed did not have agency-wide financial conflict of interest policies. GAO made nine recommendations to six agencies, including developing written procedures for addressing cases of failure to disclose required information.
Biomedical Research: NIH Should Publicly Report More Information about the Licensing of Its Intellectual Property (GAO-21-52)	Federal research and inventions can contribute to the development of life-saving drugs, vaccines, and medical devices. One way this happens is that the National Institutes of Health licenses its intellectual property to private companies that have the resources to bring products to market. GAO made two recommendations, including that NIH provide more information to the public about the licensing of its intellectual property. HHS concurred with GAO's recommendations.
Small Business Research Programs: Many Agencies' Award Issuances Are Not Timely; Some Practices May Improve Timeliness (GAO-20-693)	Federal agencies awarded almost $3 billion in FY 2019 to small businesses through two programs designed to develop and commercialize technologies—the Small Business Innovation Research and Small Business Technology Transfer programs. In most cases, agencies are to notify applicants within 90 days and issue awards within 180 days. Of the 29 agencies reviewed, half notified most applicants late.
Intellectual Property: Additional Agency Actions Can Improve Assistance to Small Businesses and Inventors (GAO-20-556)	With small businesses creating about two-thirds of U.S. jobs, they need help protecting their intellectual property. The U.S. Patent and Trademark Office and Small Business Administration offer help. However, the Patent Office doesn't evaluate whether its small business programs work as intended. GAO made four recommendations to two agencies, including that USPTO develop an agency-wide approach to evaluate the effectiveness of its efforts to help small businesses and inventors. Both agencies agreed with GAO's recommendations.

Sexual Harassment Policies: Smithsonian Has Procedures for Prevention, but Could Improve Guidance and Monitoring (GAO-20-414R)	The Smithsonian Institution has thousands of employees and supports or funds thousands of academic appointees. We looked at Smithsonian's process for responding to sexual harassment complaints and found, among other things that supervisors lack written guidance on addressing complaints. We made three recommendations, including that the Smithsonian include all of its workforce in organizational climate assessments; they agreed with all of our recommendations.
National Science Foundation: Cost and Schedule Performance of Major Facilities Construction Projects and Progress on Prior GAO Recommendations (GAO-20-268)	The National Science Foundation funds construction of large science and engineering infrastructure projects, like telescopes, that can take years to build and cost hundreds of millions of dollars. Since our March 2019 report, four major NSF construction projects had no increases in their authorized costs or schedules. For example, the Daniel K. Inouye Solar Telescope is on track to be completed within its $344.1 million budget by June 2020.
Antibiotic Resistance: Additional Federal Actions Needed to Better Determine Magnitude and Reduce Impact (GAO-20-341)	Antibiotic-resistant infections can be difficult or impossible to treat. We examined federal challenges to addressing antibiotic resistance: surveillance, diagnostics, new treatments, and antibiotic use. GAO made eight recommendations to strengthen the federal response to combating antibiotic resistance. HHS concurred with seven recommendations.
Sexual Harassment in STEM Research: Agencies Have Taken Actions, but Need Complaint Procedures, Overall Plans, and Better Collaboration (GAO-20-187)	This performance audit evaluated enforcement of Title IX—which prohibits sex discrimination, including sexual harassment—at universities receiving federal financial assistance. GAO made 17 recommendations to the five agencies funding STEM research and DOJ. The agencies agreed with GAO's recommendations and identified actions they plan to take to address them.
Innovative Technologies in Manufacturing: Commerce Has Stopped Efforts to Implement Loan Guarantee Program (GAO-20-326R)	Innovation in products, manufacturing processes, and business models often come from the efforts of small and medium-sized manufacturers. To help them get capital, a federal loan guarantee program was authorized in 2010 and the Department of Commerce was responsible for implementing it through its Economic Development Administration (EDA). However, Congress rescinded funds from EDA in 2017, 2018, and 2019, and EDA applied this to a portion of the loan guarantee program's funds, stopping its implementation.
Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO 20-81)	Public access to the results of federally funded research can accelerate scientific breakthroughs. In 2013, certain federal agencies were directed to create plans for increasing access to publications and data they funded—some agencies have not fully implemented their plans. GAO made 37 recommendations to 16 agencies to promote full and effective implementation of agency public access plans. Of the 16 agencies, 15 agreed with GAO's recommendations.
Small Business Research Programs: Many Agencies Took Longer to Issue Small Business Awards than Recommended (GAO-19-620)	Since 1982, federal agencies have given $46 billion to small businesses to help them develop and market new technologies. Businesses apply for these awards, and agencies generally aim to make awards within 180 days after the application deadline. We reviewed 15,453 awards made over 3 years: 76% were made on time. However, the 28 agencies that made the awards varied widely on timeliness—some made 100% on time and some made 0%.
Advanced Manufacturing: Innovation Institutes Have Demonstrated Initial Accomplishments, but Challenges Remain in Measuring Performance and Ensuring Sustainability (GAO-19-409)	The Departments of Commerce, Defense, and Energy have together spent $1 billion to establish 14 institutes that develop advanced manufacturing capabilities. Most of the institutes are operating under an initial 5- to 7-year period of federal financial assistance. These institutes expect possible negative consequences once this initial assistance ends. GAO made five recommendations, including that Commerce work with DOD and DOE to develop performance goals with measurable targets and timeframes. The agencies generally agreed with the criteria development recommendations.

Source: GAO. | GAO 21 510T

We also have many ongoing reviews in these areas. Some of these examine multi- or single-agency programs. For example:

- the National Strategic Computing Initiative, which focuses on high-performance computer development across the federal government;
- the multi-agency Manufacturing USA program, which aims to help bridge the gap between applied research and domestic manufacturing; and
- BioDetection 21, the Department of Homeland Security's acquisition to replace the current biological attack early warning detection system.

We are also conducting work on broader topics, such as the reproducibility and reliability of federally funded scientific research.

In addition, we continued to expand and update our best practice guides, which are authoritative documents for managing and evaluating programs. Our best practices guides lay out proven and effective approaches and decision-making tools for federal managers. We present the best practices as high-level concepts rather than as prescriptive "how to" steps so that they can be used consistently across the entire federal government. To develop the guides, we identified commonly used practices from existing studies, literature, and leading practitioners and created a draft describing leading practices from these sources. Then, we convened a working group of specialists to discuss the practices on a regular basis. The meetings were open to all interested who also had appropriate technical expertise. We shared meeting details with about 1,000 professionals from government organizations, private companies, independent consultant groups, trade industry groups, and academia. We used the information from these discussions, and analyses of any additional literature provided, to inform and update the leading practice draft, resulting in a best practice guide.

Table 4 shows the guides that we have issued or updated since 2019, including cost, technology readiness, and Agile software development best practice guides. In addition, our 2015 Schedule Assessment Guide (GAO-16-89G) continues to be a go-to resource for evaluating schedules in the federal government and other sectors. We also plan to develop a cloud cybersecurity information technology best practices guide.

Table 4: Selected Science, Technology Assessment, and Analytics New and Updated Best Practices Guides

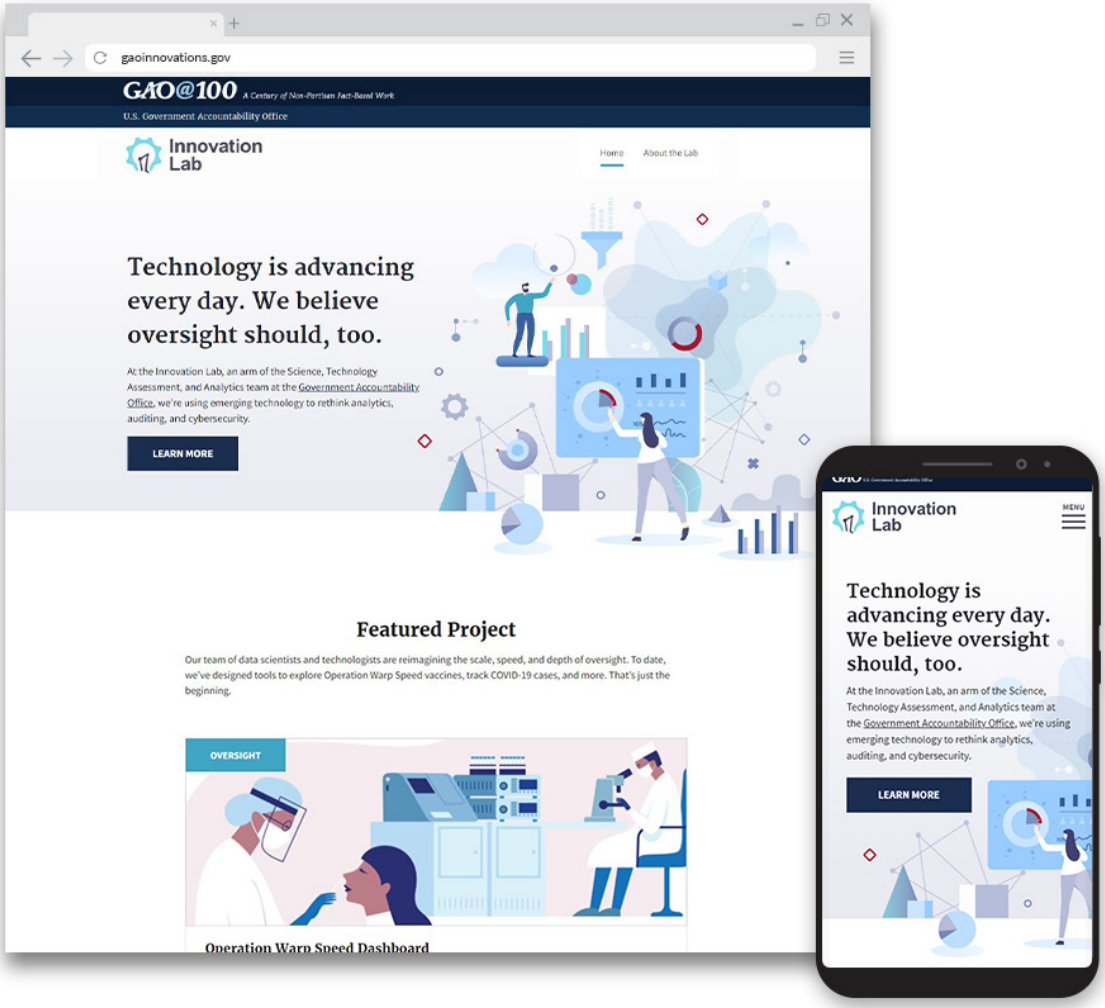
Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs (GAO-20-195G)	We issued an updated version of our best practices in cost assessment guide in 2020. The guide offers a 12-step process to develop high-quality, reliable program cost estimates applicable across government and industry.
Technology Readiness Assessment Guide: Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects (GAO-20-48G)	We finalized this best practice guide in 2020. It offers a 5-step process to develop high-quality technology readiness assessments for evaluating technology maturity in federal programs. In addition, it provides a framework to better understand technology maturity and for developing plans for technology maturation efforts
Agile Assessment Guide: Best Practices for Agile Adoption and Implementation (GAO-20-590G)	This best practice guide on agile software development provides best practices related to areas such as adoption, requirements development, and metrics.

Source: GAO. | GAO 21 510T

Innovation Lab

The Innovation Lab was established to empower GAO with new capabilities and enhanced capacity to tackle evolving accountability challenges in the Fourth Industrial Revolution through data science and emerging technologies. Made up of data scientists and technologists, the Innovation Lab is working with GAO mission teams and the broader oversight community at the cutting edge of oversight, examining the latest technological advances, every day (see fig. 5).

Figure 5: The Innovation Lab's Website

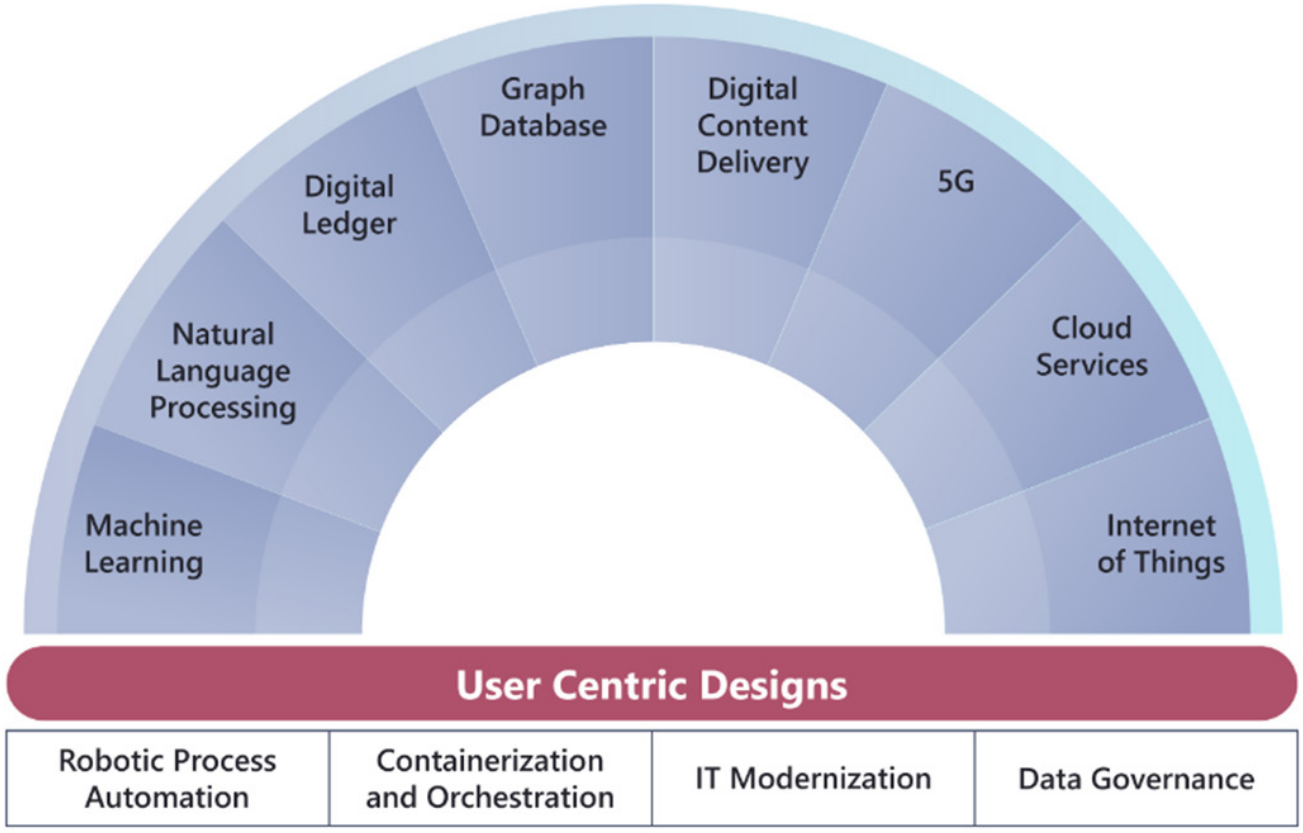


Source: GAO. | GAO-21-510T

In 2020, the Lab initiated a pilot project in collaboration with key financial agencies to use advanced analytics to enhance payment integrity and thus reduce improper payments. Federal agencies estimate that in fiscal year 2020, 98 programs from 21 agencies made approximately $206.4 billion in improper payments. Furthermore, improper payments have been estimated to total almost $1.7 trillion government-wide from fiscal years 2003 through 2019. The Lab also implemented GAO's first advanced cloud infrastructure to support leading-edge development of analytical

tools that GAO can employ to analyze especially large volumes of data to more effectively support evidence-based policymaking. We also plan continued technical experimentation on blockchain, graph databases, robotic process automation, Internet of Things, augmented reality, and complex natural language processing capabilities to enhance support a range of audit and oversight products (see figure 6).

Figure 6: The Innovation Lab's Technical Areas of Focus



Source: GAO. | GAO-21-510T

Building Networks of Experts

We further expanded our network of S&T experts to increase the depth, breadth, and diversity of knowledge we have access to in order to meet congressional needs. In October 2020, STAA hosted the inaugural meeting of the Polaris Council, a group of exceptional science, technology, and policy leaders and experts from many fields, established

to advise us on emerging S&T issues facing Congress. Membership includes top leaders in the S&T community—from nonprofits, academia, and current and former practitioners of legislative technology assessments (listed at the end of this appendix). The Council is now standing up working groups to explore: expanding our product line to meet congressional needs, new methods to conduct our work, and improving communication to help ensure that policymakers and the public are aware of us as a nonpartisan, fact-based, and trusted resource.

To further develop and strengthen our networks of experts, we also participated in 210 external speaking events in 2020. These included events with S&T organizations, such as NAM, universities, scientific societies, federally funded research and development centers, and others. We leverage these networks to inform many aspects of our work, including many of the studies mentioned in this report. For example, we often reach out directly to experts in our networks to interview them about topics we are addressing. In other cases, we draw expertise from scientists, engineers, and physicians through routine engagement with the National Academies of Sciences, Engineering, and Medicine. Since 2001, we have maintained a standing contract that allows National Academies personnel to help GAO identify experts and assist with convening expert meetings for GAO. Many of our products, including technology assessments, benefit from convening such expert meetings, including our recent work on AI in medical services, which is shown in figure 7 below. We also routinely interact with the National Academies' Government-University-Industry Research Roundtable, a convening series that defines and explores critical issues from cross-sectoral perspectives related to horizon scanning and insights into national and global science and technology trends.

Figure 7: Artificial Intelligence in Medical Services Expert Panel

Sources: GAO, Andrey Popov/stock.adobe.com. | GAO-21-510T

Update to STAA's 2019 Plan

Since establishing our team in January 2019 and developing our plan, we have substantially enhanced our ability to provide Congress with thorough and balanced analyses of technological and scientific developments that affect society, the economy, and the environment. We have built significant capacity to produce S&T products and services and more needs to be done. Our fiscal year 2022 budget request is focused in part on continuing to grow the team and implementing the plan we provided to Congress in 2019.

While we have continued to grow in accordance with the plan we provided in 2019, we continue to be committed to achieving the 140 full-time equivalent total staff that we anticipate we will need to meet growing congressional demand. At the beginning of fiscal year 2020, our team included about 70 members, and as of January 2021 we were up to 104 members. We now have staff with doctoral degrees in a wide variety of fields, such as microbiology, quantum mechanics, public health, nuclear physics, environmental chemistry, data analytics, and aerospace engineering, with additional staff holding STEM-related masters degrees. Our staff continue to benefit from collaboration with GAO's broader workforce of subject-area policy analysts, economists, social scientists, methodologists, and attorneys across our 14 other mission teams and staff offices. This access to a well-trained and diverse talent pool brings a powerful and sophisticated perspective to our work as we conduct technology assessments and analyze the policy implications of a range of S&T topics for Members and their staffs.

As we continue to assess anticipated future work and S&T issues that will be of interest to the Congress, we plan to continue hiring to add expertise in areas such as:

- Biological sciences for emerging infectious diseases, epidemiology, synthetic biology, biosafety, and biosecurity work
- Computer/systems/electrical engineering for digital and communications technologies (e.g., 5G wireless, blockchain, quantum cryptography, and artificial intelligence/machine learning systems)
- Applied math, engineering science, and computer science for advanced analytics, data science, and data engineering
- Environmental sciences, such as atmospheric chemistry and environmental engineering

We also have authority to bring in expertise in other ways. For example, through the Intergovernmental Personnel Act, we can bring in personnel such as experts from academia and from S&T organizations, such as National Laboratories or the National Academies, as well as personnel from state and local governments.[5] This authority may be useful in

[5]The Intergovernmental Personnel Act Mobility Program provides for the temporary assignment of personnel between the federal government and state and local governments, colleges and universities, Indian tribal governments, federally funded research and development centers, and other eligible organizations. Assignment agreements can be made for up to two years, and may be intermittent, part-time, or full-time.

meeting project-specific needs, particularly around the latest S&T advances.

We have already accomplished key goals from our 2019 plan, such as creating multiple new product types to better meet Congress's needs and developing additional methods and standards appropriate to technology assessments. Continued growth to the team's target size of 140 full-time employees will help us meet growing congressional demand by:

- Increasing the number of technology assessments we conduct each year
- Increasing the number of short-to-medium turnaround products
- Expanding technical assistance
- Improving access to and absorption of our work through the use of a variety of digital publishing tools, such as online "dashboards"
- Piloting and deploying multiple advanced data analytics prototypes to enhance congressional oversight and support

GAO's Congressional Protocols and STAA's Implementation

Our work directly supports congressional interests, and our congressional protocols are intentionally flexible to help ensure we can meet the needs of the Congress. We conduct all of our work either 1) in direct response to mandates or requests from committees or Members, or 2) under the Comptroller General's authority (CGA) in recognition of broad congressional interest in a topic. STAA has never turned down a request for assistance from the Congress, including from individual Members. We have found that our protocols have given us the flexibility to meet congressional needs in a variety of ways and do not warrant changes at this time. This is also consistent with NAPA's recommendation that we use the same system to prioritize our work as we use for prioritizing performance audits.

Congressional Protocols

We prioritize our work based on our congressional protocols, which GAO designed in consultation with Congress.[6] These protocols help ensure we work constructively with Congress and conduct our work in accordance with congressional priorities to meet the needs of both parties. They also ensure that we are consistent in dealing with all committees and individual members. The protocols provide a sequence of steps, which allows us to efficiently and effectively receive, prioritize, and respond to congressional requests.

[6]GAO, *GAO's Congressional Protocols,* GAO-17-767G (Washington, D.C.: Jul. 17, 2017).

To ensure adherence to GAO's core values, effective management practices, and efficient use of resources, our protocols specify that we will initiate work according to the following priorities:

1) congressional mandates, because they are the broadest expression of congressional interest;

2) senior congressional leader and committee leader requests (chairs and ranking members), both of whom receive the same priority; and

3) individual Member requests.

Although our protocols specify these priorities, to date we have never turned down a request for assistance from the Congress, where we have legal authority.[7] We employ a variety of approaches to ensure that we consistently meet congressional needs. These approaches relate to both how we initiate our work and what type of work we do.

We make appropriate use of CGA, which allows us to undertake work that is not directly tied to requests. CGA can be useful for topics that are of broad interest in Congress, such as longer-range, crosscutting, and transformational issues as well as current and emerging issues that may affect the nation's future. STAA has expanded use of CGA to initiate work to ensure our work is responsive and timely. We have used CGA to initiate a wide variety of work—including for individual Members—such as technology assessments, Science & Tech Spotlights, performance audits, and best practice guides.

[7]There are some situations in which GAO may not accept a request, such as if we do not have statutory authority to address the topic or if any related audit or investigation, including a criminal investigation, is ongoing or imminent by another governmental entity.

Enclosure(s)-2

GAO Science & Tech Spotlights

GAO. *Science & Tech Spotlight: Vaccine Safety*. GAO-21-342SP. Washington, D.C.: February 24, 2021.

GAO. *Science & Tech Spotlight: Tracing the Source of Chemical Weapons.* GAO-21-271SP. Washington, D.C.: December 21, 2020.

GAO. *Science & Tech Spotlight: Air Quality Sensors*. GAO-21-189SP. Washington, D.C.: December 07, 2020.

GAO. *Science & Tech Spotlight: Agile Software Development*. GAO-20-713SP. Washington, D.C.: September 29, 2020.

GAO. *Science & Tech Spotlight: Consumer Electronics Recycling*. GAO-20-712SP. Washington, D.C.: August 31, 2020.

GAO. *Science & Tech Spotlight: Contact Tracing Apps*. GAO-20-666SP. Washington, D.C.: July 28, 2020.

GAO. *Science & Tech Spotlight: Herd Immunity For COVID-19*. GAO-20-646SP. Washington, D.C.: July 7, 2020.

GAO. *Science & Tech Spotlight: E-cigarettes*. GAO-20-610SP. Washington, D.C.: June 30, 2020.

GAO. *Science & Tech Spotlight: COVID-19 Modeling*. GAO-20-582SP. Washington, D.C.: June 4, 2020.

GAO. *Science & Tech Spotlight: Quantum Technologies*. GAO-20-527SP. Washington, D.C.: May 28, 2020.

GAO. *Science & Tech Spotlight: COVID-19 Vaccine Development*. GAO-20-583SP. Washington, D.C.: May 26, 2020.

GAO. *Science & Tech Spotlight: COVID-19 Testing*. GAO-20-584SP. Washington, D.C.: May 20, 2020.

GAO. *Science & Tech Spotlight: Social Distancing During Pandemics*. GAO-20-545SP. Washington, D.C.: May 13, 2020.

GAO. *Science & Tech Spotlight: CRISPR Gene Editing*. GAO-20-478SP. Washington, D.C.: April 7, 2020.

GAO. *Science & Tech Spotlight: 5G Wireless*. GAO-20-412SP. Washington, D.C.: March 27, 2020.

GAO. *Science & Tech Spotlight: Coronaviruses*. GAO-20-472SP. Washington, D.C.: March 3, 2020.

GAO. *Science & Tech Spotlight: Nuclear Microreactors*. GAO-20-380SP. Washington, D.C.: February 26, 2020.

GAO. *Science & Tech Spotlight: Deepfakes*. GAO-20-379SP. Washington, D.C.: February 20, 2020.

GAO. *Science & Tech Spotlight: Hypersonic Weapons*. GAO-19-705SP. Washington, D.C.: September 16, 2019.

GAO. *Science & Tech Spotlight: Blockchain & Distributed Ledger Technologies*. GAO-19-704SP. Washington, D.C.: September 16, 2019.

GAO. *Science & Tech Spotlight: Opioid Vaccines*. GAO-19-706SP. Washington, D.C.: September 16, 2019.

GAO. *Science & Tech Spotlight: Probabilistic Genotyping Software*. GAO-19-707SP. Washington, D.C.: September 16, 2019.

Polaris Council Membership

Jeffrey M. Alexander, Director, Innovation Policy, RTI International

Robert D. Atkinson, President, Information Technology and Innovation Foundation

Mojdeh Bahar, Associate Director for Innovation and Industry Services, National Institute of Standards and Technology

Duane Blackburn, Deputy Director, Center for Data-Driven Policy, MITRE

Marjory Blumenthal, Senior Policy Researcher, RAND Corporation

William B. Bonvillan, Lecturer, Massachusetts Institute of Technology

Dan Chenok, Executive Director, Center for the Business of Government, IBM

Thomas M. Connelly, Executive Director and CEO, American Chemical Society

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Stephen Welby, Executive Director and Chief Operating Officer, IEEE

David E. Winickoff, Senior Policy Analyst and Secretary of the Working Party on Bio-, Nano- and Converging Technology, Organisation for Economic Co-operation and Development

Appendix III: GAO's Strategic Plan Framework

Source: GAO. | GAO-21-510T