

Analysis at APL in 2042

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ABSTRACT

As the role of technology continues to expand around the world, rigorous, multidisciplinary analysis is increasingly needed to inform technical solutions to the nation's most pressing challenges. With their deep technical and operational knowledge, analysts at the Johns Hopkins University Applied Physics Laboratory (APL) have long partnered with senior government decision-makers to help them solve immediate challenges and to envision and prepare for future challenges. These partnerships will be stronger than ever when APL celebrates its 100th anniversary in 2042, as APL continues to provide the robust, insightful, and well-communicated analysis that our nation's senior leaders require.

It is 2042 and APL analysts are in great demand. APL is using analysis to inform the creation of defining innovations, their potential uses, the investments needed to fulfill their promise, and the policies necessary to govern their introduction. As a result, APL's analysis is valued by its sponsors and by APL technical staff members across the Lab.

Part of the reason APL analysis is in such demand is the ever-increasing need for technically informed analytic approaches. The role of technology has continued to explode in the world, in this nation as well as for our potential adversaries. In 2042, early adoption of key technologies is even more important for our military than in the past. It is clearly understood that the ability to conceive of technology applications through the design of new or enhanced weapon systems, coupled with innovative concepts of operation, will determine the “winners” and “losers” of future conflicts. APL analysts are deeply knowledgeable of adversary capabilities

and, by 2042, they are recognized for their insights into key threat strategies and developments. APL analysis that combines this understanding of our adversaries with deep technical and operational knowledge is key to assessing the potential effectiveness of new approaches designed to counter adversary advances.

In 2042, APL analysis underpins bold visions of the future force. Dating back to 2020, APL began a series of studies under the *Here to There* concept. In this concept, depicted in Figure 1, APL analysts and technical developers recognized that for Department of Defense leaders to invest in the most promising new technologies, they needed to see how investments today would take the current force—*here*—to an envisioned future force—*there*. These analyses were compelling to senior decision-makers then and continue to be compelling in 2042. They provide relevant and visionary stories of what the future force might become. They are used by senior decision-makers to craft comprehensive Research,

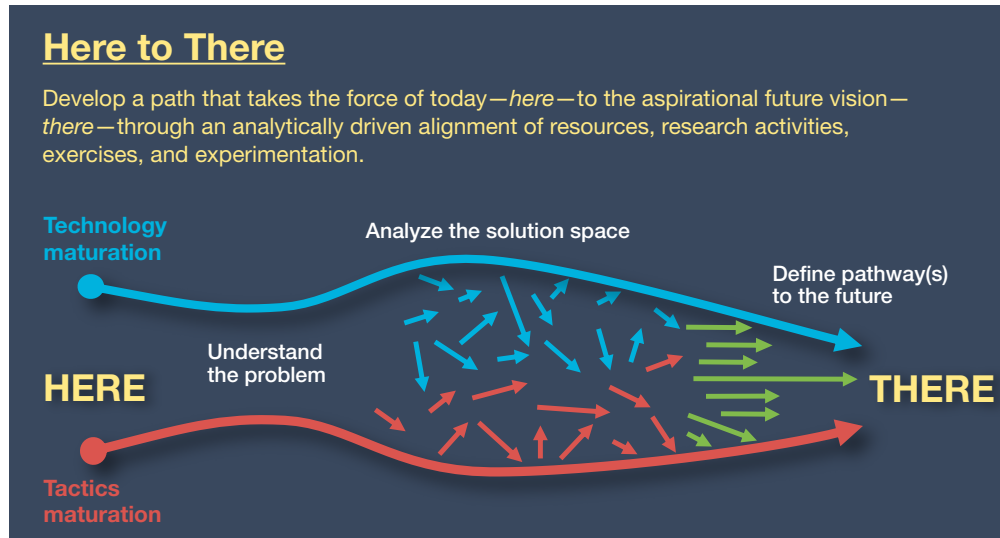


Figure 1. The path from here to there. APL analysts and technical developers recognized that for Department of Defense leaders to invest in the most promising new technologies, they needed to see how investments today would take the current force—*here*—to an envisioned future force—*there*. They explored this concept in the *Here to There* studies.

Development, Test and Evaluation (RDT&E) roadmaps that lead to these exciting futures. This work is made possible by analysts who have deep operational understanding gained from embedded analyst assignments in military commands. These analysts work alongside APL's innovative and expert scientists and engineers to understand the art of the possible and to assess which technology-enabled visions will have the greatest game-changing impact for the nation.

Investment decisions are not easier in 2042, and debates about which technologies are the most important—and their affordability—still rage. APL cost analysts work closely with APL program managers to estimate development, production, and sustainment costs. Analytic assessments of the relative effectiveness of different technical solutions are combined with cost information to help senior leaders make cost-benefit trade-offs and support senior decision-making.

APL's technical and operational analytic expertise extends beyond military applications to other elements of national security. By 2042, APL analysts are deeply engaged with technologists across the Laboratory to develop visionary concepts in areas such as homeland security, health, climate, and space. In each case, APL analysts use relevant and rigorous analysis to understand the challenges and identify the most innovative and effective methods to meet them.

As new technologies are introduced, there are greater and greater legal, ethical, and cultural implications, at home and abroad. Which technologies pose risks to individual privacy and freedom? Which technologies pose threats from unintended consequences? Which technologies will exacerbate economic divides, and which will help resolve them? How do our adversar-

ies and allies view these issues? The development and adoption of new technologies within the international community requires adherence to international laws and norms. As new technologies emerge, those laws and norms need to be developed. Beginning in 2015, APL analysts began working on the ethical and legal considerations of new technologies and, within just a few years, made significant contributions in the area of cyber norms and to the development of ethical frameworks for lethal autonomous systems. That work has grown, and in support of the government, APL analysts of 2042 are central to these national and international debates, helping to determine how to adopt technologies into our societies and how to appropriately use them for our collective defense. In 2042, APL is known for its ability to tackle these questions through the combination of technical and policy analysis and is a recognized leader in domestic and international technology policy.

To be effective, analysis in 2042 must be robust, insightful, and clearly communicated, and APL analysts excel at all three. APL analysts tackle the most complex, important, and unstructured problems. They have the reputation of providing transparent, rigorous, and defensible work. Senior leaders seek APL analysis because they know it will offer insights that are relevant to their issues. And they know that these insights will be clearly and concisely communicated in a way that helps them make the best decisions possible.

Insightful analysis requires a multidisciplinary approach, and the APL staff of 2042 includes some of the best scientists, engineers, and social scientists in the country. Disciplines that have been the basis of the Lab's work for decades, like engineering, math, and physics, remain key, but analysts from different disciplines,

including biology, anthropology, history, and public policy, have joined APL to conduct this work. Cross-disciplinary teams are routinely formed to tackle challenges across the Lab, and APL analysts are in demand by technical teams in all sectors and departments.

Finally, in 2042, APL analysts play a key role in helping Lab leadership prepare for the future. They are able to help leadership anticipate that future, make trade-offs and assessments, and craft the best approach for new strategic initiatives. This, in turn, is used to inform internal research and development investments and, in partnership with the Lab's research department, to identify the most significant "mission impossible" initiatives. By 2042, analysis is used by leaders across the Lab to design their vision, strategy, and execution priorities (VSEs) and assess their progress against them.

In an increasingly complex world, rational, fact-based, insightful analysis is essential. Even today, the art of analysis is being subsumed by off-the-shelf, one-size-fits-all tools. APL is keeping the art of analysis alive, and by 2042, the depth of APL's analytic capability is extensive and highly valued and, as a result, key to helping APL make critical contributions to critical challenges.



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Christine H. Fox is the assistant director for policy and analysis at APL, where she is responsible for connecting APL's considerable technology expertise to broader policy issues. She has a BS in mathematics and an MS in applied mathematics from George Mason University. Before joining APL, she was acting deputy secretary of defense; director of cost assessment and program evaluation in the Office of the Secretary of Defense; president of the Center for Naval Analyses; and scientific analyst to the chief of Naval operations. She is on the board of directors of the US Naval Institute, a trustee for the Woods Hole Oceanographic Institution, a member of the Advisory Committee for the National Academy of Sciences Division on Engineering and Physical Sciences, and a life member of the Council on Foreign Relations. She is a three-time recipient of the Department of Defense Distinguished Service Medal and has been awarded the Department of the Army's Decoration for Distinguished Civilian Service. Her email address is christine.fox@jhuapl.edu.