

Dialogues with Industry

Fourth Series

Accelerating Ocean Enterprise
Growth in Future Key Markets:
Impacts of Dual-Use on the
Ocean Enterprise

Report Out from Dialogue 1

Table of Contents

Dialogue Purpose	3
Key Takeaways from the Dialogue	3
Dialogue Description	4
Discussion Synthesis	5
Section 1: Understanding the Impact of Dual-Use on the Ocean Enterprise	5
Investment	6
Regulations	7
Section 2: Scaling, Procurement, & the Future of Dual-Use Ocean Technology	7
Fragmentation	7
Resiliency	8
Procurement	9
Durability	9
Space Sector as a Model	10
Section 3: The Wider Impact of Dual-Use Ocean Technology	10
Data	10
International Scientific Collaboration	11
Adjacent Industries	11
Workforce	12
Open Session	13
Commercial Data Purchase	13
Constraints for Start-Ups	13
Potential for Intermediaries	13
Potential Pathways Forward	14
Appendix 1: Participants	15
Appendix 2: Use Case: Impacts of Dual-Use on Ocean Technology	16
Appendix 3: Planning Team	23

Dialogue Purpose

The Ocean Enterprise Initiative is a global effort that spearheads innovation, thought leadership, and economic development within the Ocean Enterprise. It is co-led by the Marine Technology Society (MTS), Global Ocean Observing System (GOOS), National Oceanic and Atmospheric Administration (NOAA), and Industry (Kongsberg Discovery).

The [Dialogues with Industry](#) (hereafter *Dialogues*) is a signature pillar of the Ocean Enterprise Initiative. The *Dialogues* series has been co-designed for focused discussions between the private, public, and academic sectors to identify challenges and explore solutions. The first, September 2022 – January 2023, explored how to mature the Ocean Enterprise to deliver essential societal, economic, and environmental benefits. This culminated in the [Dialogues with Industry Roadmap](#) (hereafter Roadmap). The Ocean Enterprise Initiative is the structure to implement recommendations from the Roadmap guided by three goals:

- Improving the Marketplace
- Collaboration to Grow and Impact Change
- Shaping the Future

The second *Dialogues*, January – February 2025, focused on Harmful Algal Blooms. Access the summary report [here](#). The third *Dialogues*, October – November 2025, focused on the future of ocean observing. Access the summary report [here](#).

The fourth *Dialogues* is focused on emerging markets. The Ocean Enterprise is described as a **portfolio of markets**, not a single market. Its emerging markets have significant potential but remain constrained by fragmented demand, inconsistent regional requirements, limited standards, and unresolved data-governance issues. The first in the series frames **dual-use ocean technology** as technology developed for civilian, scientific, environmental, or commercial purposes that can also support defense missions.

Key Takeaways from the Dialogue

The panelists generally viewed dual-use as a major opportunity for the Ocean Enterprise, but not an automatically positive one. Its benefits will depend on deliberate choices about interoperability, procurement, data access, environmental safeguards, international cooperation, and workforce development. The key takeaways are summarized from the comments of the panelists.

- **Build shared technical foundations and diversified markets while preserving clear pathways for civilian science and public access.** Defense demand can accelerate technology and create scale, but resilient companies and a healthy Ocean Enterprise cannot depend on defense alone.
- **Adjacent markets benefit.** The currently observed dual-use push on technology development and production upscaling could propel the Ocean Enterprise into adjacent markets such as insurance, coastal weather predictions (for port operations, coastal protection, etc.),

biodiversity monitoring connected to BBNJ (Biodiversity Beyond National Jurisdiction) and also relevant in the context of deep-sea mining.

- **Innovation comes from the full Ocean Enterprise.** Start-ups are important, but established companies also play distinct and essential roles.
- **Investment is a mixed picture.** While there has been an increase in venture investors because of the new defense focused dollars, there is also hesitancy from traditional and institutional investors as they evaluate investment alignment with their mandate and values.
- **Cadence and scalability of product development.** The focus on defense has accelerated the innovation to design timescales down to weeks and put demands on companies to ramp up production to scales significantly larger than what they knew from civilian markets.
- **Inequality in regulation may be inhibiting maritime innovation.** United States International Traffic in Arms (ITAR) and related requirements are more difficult for maritime uncrewed systems (UxS) than for land-based systems.
- **Data sharing is not necessarily an all-or-nothing conflict.** While paths were identified to enable sharing between public, commercial, and defense, easy to understand protocols do not exist. With the increased data coming from UxS and other ocean technologies, this is becoming a greater issue.
- **From data sharing to platform sharing.** With more platforms deployed, the concept of *data sharing* could be expanded by the idea of *platform sharing*, where platforms would carry several payloads collecting data for different customers/users simultaneously.
- **Manufacturers need clarity on the defense operating model.** A major question is whether ocean platforms will be treated as disposable systems or as assets that will be refurbished, upgraded, and maintained. The answer materially affects product design and revenue models.
- **The current defense-driven surge is likely finite.** Estimates discussed ranged from roughly two to ten years. There was disagreement over whether this is a temporary cycle or part of a longer-standing pattern of military investment spilling into commercial use in the ocean.

Dialogue Description

The dialogue brought together 12 experts from industry, government, non-governmental, and academic organizations for a virtual discussion diving deeper into the impacts of dual-use on ocean technology (see list of the participants in Appendix 1). In preparation, the participants were provided with the Accelerating Ocean Enterprise Growth in Future Markets background paper and the Use Case: Impacts of Dual-Use on Ocean Technology (Appendix 2).

The Use Case was divided into three sections:

- (1) Understanding the Impact of Dual-Use on the Ocean Enterprise;
- (2) Start-up Scaling, Defense Procurement, and the Future of Dual-Use Ocean Technology; and
- (3) The Wider Impact of Dual-Use Ocean Technology: Market Expansion, Data Concerns, Workforce Growth, and Wider Impact.

Each section of the Use Case included questions to help participants prepare and serve as a guide for the dialogue discussion.

Invited experts from five countries joined the discussion, representing the following sectors: Private – 83%; Governmental/Intergovernmental – 8%; Academia – 8%. In addition, approximately 55 individuals from 10 countries joined as observers, providing input primarily via chat and questions.

Hans VanSumeren, Senior Director, Ocean Enterprise Initiative, Marine Technology Society, moderated the discussion and invited participants to provide feedback and recommendations on the sections outlined above. The first two hours of the dialogue focused on discussion among the experts, while the moderator integrated comments and questions from the observers. During the last thirty minutes, observers engaged in an open question-and-answer session with the experts.

This was the first dialogue in the Accelerating Ocean Enterprise Growth in Future Markets series (the fourth *Dialogues with Industry* series). The key takeaways and potential paths forward are outlined in this synthesis report on a non-attributational basis.

Discussion Synthesis

Section 1: Understanding the Impacts of Dual-Use on the Ocean Enterprise

Participants discussed how geopolitical pressures, rising defense budgets, venture capital, and rapid commercial innovation are reshaping ocean technology. Defense customers are increasingly adopting existing commercial technologies, accelerating development, shortening traditional product cycles, and requiring companies to respond quickly to changing geopolitical needs. This faster pace creates opportunities but strains staffing, supply chains, production capacity, and organizational readiness. Panelists emphasized that innovation does not come from startups alone; established firms provide essential technical expertise, manufacturing capacity, and new solutions.

A healthy balance would use the defense demand to strengthen the broader industrial base without making military procurement the sole source of market viability. Shared investment in development, manufacturing, testing infrastructure, and reusable technical foundations can lower costs and support scalability across specialized ocean markets. Common requirements should be identified early, with mission-specific features addressed separately, so extensive customization does not undermine dual-use efficiencies. Civilian observing, scientific research, environmental monitoring, and commercial deployment still need sustained, dedicated funding, because defense purchasing is driven by operational priorities that may be episodic or misaligned with long-term public needs.

For companies, the choice is more complex than whether to just accept defense funding. Investor nationality and ownership can determine who may invest, which technologies a company can access, where it can sell, and who may acquire it. These constraints may arise before formal export controls or procurement rules apply, quietly fragmenting national and regional markets. A company financed or structured for one jurisdiction may therefore face greater barriers to entering another, particularly across Europe and the United States, than conventional growth assumptions suggest.

Participants also emphasized that innovation flows in both directions: defense demand can accelerate technologies with scientific and commercial applications, while civilian oceanographic systems can be adapted for situational awareness and other security missions. Sustaining this exchange requires clear civilian pathways, stronger communication across sectors, and environmental criteria in defense and dual-use procurement.

At the same time, dual-use growth raises questions about balancing legitimate defense needs with peace-time scientific activity, especially in demilitarized regions and other sensitive environments. As technology advances faster than legal and policy frameworks this will blur the gap between pure scientific use and military use.

Investment

Panelists described a shifting investment landscape as the established blue economy increasingly intersects with defense and security. Blue economy investment has traditionally emphasized sustainability, public benefit, and measurable environmental impact, and has attracted substantial capital in recent years. Defense investment, by contrast, is driven more directly by geopolitical urgency, public procurement, national-security priorities, and high return-on-investment expectations. This convergence is drawing new funding and attention to ocean technologies while requiring companies and investors to distinguish between broad ocean-economy opportunities and businesses whose value depends heavily on defense demand.

Dual-use creates more complex choices. While this gives companies more funding pathways, which can be stabilizing and thus create opportunity, it was also brought up that it can complicate their decisions about where they should focus, whether dual-use aligns with their mission and tenets, and how technologies may or may not diverge to meet dual-use applications. Investors face similar questions about what they are supporting and whether future applications will remain consistent with their mandates. The goal is to develop investments and business models that support dual-use.

Across Europe, increased public funding for defense and dual-use innovation is being paired with technical assistance, procurement reform, and efforts to attract private capital. These measures have drawn more venture investors to the sector, although some traditional and institutional investors remain cautious about whether the recent defense exposure aligns with their organizational values. Programs such as BlueInvest were established to mobilize private investment in sustainable blue technologies and initially benefited from the European Union Green Deal. Funding is being redirected to security and defense priorities rather than expanding the overall funding pool. European environmental regulations remain in place, but their enforcement and influence may change as policy priorities evolve.

Regulations

United States International Traffic in Arms Regulations (ITAR) restrictions and related international regulations on UxS may be triggered by system size and endurance, limiting the export or transfer of larger, long-range platforms. ITAR also controls collision-avoidance technology that enables uncrewed surface vessels to comply with the International Regulations for Preventing Collisions at Sea (COLREGs), even when its primary purpose is safe navigation. Comparable technologies in aviation and land-based systems are generally treated as safety features rather than military capabilities. In the maritime sector, however, these controls can restrict operations and business, complicate deployment, and hinder collaboration with international researchers, suppliers, partners, and customers.

These impacts stem from regulations that have not kept pace with autonomous maritime technology. Rules should distinguish COLREGs-compliant collision avoidance, a safety function designed to prevent harm, from military targeting systems intended to identify and engage targets to facilitate dual-use functionality.

Section 2: Scaling, Procurement, & the Future of Dual-Use Ocean Technology

Section 2 looked at whether defense-backed investment will reduce fragmentation or deepen it. The discussions examined how the defense technology startup boom and rising investment are reshaping the ocean technology landscape, accelerating innovation, and scaling production, while also pressuring startups to prioritize defense markets and navigate the gap between research and development funding and durable procurement programs.

Fragmentation

Fragmentation within the Ocean Enterprise markets was identified multiple times by the participants. Below highlights the aspects of fragmentation that were discussed.

- **Fragmentation across markets:** Civilian demand is dispersed across programs, countries, and specialized applications, while defense markets add distinct procurement systems, security rules, national priorities, and supplier preferences. European initiatives, including proposed changes to defense procurement, may encourage joint purchasing and collaboration, but measures intended to strengthen regional capacity could also create new boundaries between European and non-European markets.
- **Limits on addressable markets:** Even when technologies have broad potential, firms must secure customers and demonstrate growth within markets divided by geography, funding sources, mission, marketing venues (i.e. different trade shows and ways of interacting with customers in their respective markets), and procurement pathways. Growth capital can help companies bridge those divisions, but it does not remove the underlying barriers.
- **Capital and ownership constraints:** Investor location and company ownership can shape access to technologies, customers, partners, and acquirers before formal export controls or procurement rules apply.

- **Dual-use scaling tradeoffs:** A commercial-first pathway can allow companies to run pilots more quickly, validate a common core product, and then adapt packaging or mission-specific features for defense customers. A commercial-first approach works best when companies can later adapt a shared core product also to dual-use applications rather than creating separate technologies and teams.
- **Fragmentation may still produce useful innovation:** Although defense-backed investment may initially create a fragmented or disorderly market, it was argued that this “creative destruction” could generate valuable technologies, especially innovations that reduce the cost of deploying ocean observation payloads. Commercial companies should act as fast followers by identifying defense-originated advances and adapting them to civilian markets.

Resiliency

The current wave of defense investment can strengthen the Ocean Enterprise by expanding not replacing the markets companies already serve. Large procurement contracts and development funding can lower deployment barriers, help bridge the gap between prototypes and operational systems, and enable commercially established firms to adapt proven technologies for defense missions. The strongest candidates are often companies with an existing commercial or scientific product, even in a small market, that can enter defense markets. Continued commercial activity provides revenue, market validation, and an alternative when defense awards are delayed, reduced, or canceled, while defense funding can support development and ease the transfer of common technology between sectors. However, companies, and especially start-ups, may have scarce resources and lack the time, capital, and staff to sustain parallel customer relationships, compliance processes, and product strategies.

Standards are another area where defense investment may or may not strengthen the ocean technologies market. Common interfaces and requirements can improve interoperability and scale, but defense standards are often closed or highly prescriptive. When they determine a system’s architecture, companies may have to build specifically for military rules, effectively separating the defense product from its commercial counterpart. Relaxing unnecessary constraints, keeping architectures modular, and allowing commercially determined solutions where possible would make it easier for advances to move across both markets.

Where contract volume is sustained, defense purchasing can materially strengthen supply chains and manufacturing readiness. Companies that once bought components in small quantities can place much larger orders, hold inventory, and achieve economies of scale that research demand alone may never support. These gains can lower costs and product prices, improve availability for civilian customers and reduce payload costs for civilian applications in the long run.

The Ocean Enterprise also becomes stronger through complementary specialization. Defense investment can advance platforms such as uncrewed surface vehicles, while civilian and scientific users deepen capabilities in data interpretation and broader operational applications. Deliberate exchange between these communities can allow each to build on the other’s expertise without requiring every organization to perform the same role. It also reinforces the idea that it can be beneficial for companies to address multiple markets (science/military), not only to manage fluctuations in demand, but also to build internal capabilities and improve their service offering.

Defense demand alone does not necessarily produce the most adaptable products. Military customers typically test a system for a defined mission, environment, timetable, and set of constraints. Commercial and scientific users expose the same technology to a wider range of conditions and frequently apply it in unanticipated ways. That broader use can reveal weaknesses, improve quality, and expand the product's long-term utility. A defense-focused development path that excludes this feedback may therefore deliver a capable mission-specific solution while weakening the common product needed for wider use.

Procurement

New procurement mechanisms for defense applications, including Other Transaction Authority agreements, are creating faster and more accessible pathways for nontraditional vendors. Participants credited these approaches with helping companies cross the “valley of death” between research and development funding and growing sales revenue. The challenge is uneven execution: while there may be senior-level (department or agency) support for rapid procurement, companies are still encountering substantial bureaucracy in the form of differing requirements, slower decision-making at the lower levels.

The sustainability of these procurement opportunities remains uncertain. Accelerated authorities and funding priorities operate within political cycles, so companies cannot assume that today's acquisition window will remain open long enough to support their development and growth plans.

New procurement can concentrate funding on technologies that are already technically achievable. However, early acquisition surges do not establish the size or permanence of the market. Long-term demand will depend on whether defense customers treat ocean platforms as replaceable systems purchased repeatedly or as durable assets requiring sustainment, upgrades, and maintenance. Until that operating model is clear, companies face uncertainty about production volumes, recurring revenue, workforce expansion, and the capacity of investments needed to serve defense applications.

Durability

Participants offered different views on whether the current increase in defense spending represents a temporary cycle or a lasting change in ocean-technology innovation and procurement. The more optimistic view draws on historical precedents, including space-era investment, in which concentrated public spending produced technologies that later became commonplace. From this perspective, continuing concern about maritime security, climate, and ocean health will sustain demand and leave enduring capabilities, even if the near term is volatile. Estimates of the most unsettled period ranged from roughly two to five years, with expectations that companies will need to pivot, scale, and adjust production rapidly.

A second view was cautiously positive about durability but distinguished sustained strategic interest from current market pricing. Defense demand could remain significant for five to ten years, particularly while geopolitical pressures persist, yet today's elevated valuations may prove difficult to support if anticipated procurement contracts do not materialize. Participants expected market correction within the next several years as investors test projections against actual awards and recurring orders. Further, defense demand may determine which firms survive. In crowded fields such as autonomy, governments' supplier selections could create winners and losers. High valuations may fall if expected procurement contracts fail to materialize, encouraging market correction and eventual consolidation.

Other participants questioned whether increased spending would create genuinely dual-use companies or primarily expand a defense-specific sector. Although the underlying technology may be similar, military deployment requires specialized training, operating frameworks, compliance processes, customer networks, and sales channels that differ substantially from commercial practice. New procurement approaches may become more commercially oriented, but the operational and institutional differences can still push firms toward separate business units or eventual spin-offs rather than a permanently integrated dual-use model to outpace competition.

Space Sector as a Model

The space sector offers a useful model for how ocean technology may evolve. In both domains, technological development can outpace regulation, creating a role for industry in establishing practical operating norms while governments adapt their rules. However, maritime coordination is more complex because it must account for centuries of international law and established practice, rather than a relatively concentrated regulatory framework.

Space also demonstrates how sustained public investment and competition can reduce costs, scale infrastructure, and generate technologies with broad commercial and public benefits. Ocean technology could follow a similar path: even if early investment produces fragmentation and market disruption, competing approaches may eventually lower the cost of deploying observation systems and create durable spillover effects. Shared infrastructure could support civilian, scientific, commercial, and defense users through differentiated access, timing, and data-resolution rules, while commercial data providers could supply observations that governments aggregate into unified public products.

Section 3: The Wider Impact of Dual-Use Ocean Technology

Section 3 focused on ownership and control of ocean data, international scientific collaboration, adjacent commercial markets, and workforce needs.

Data

Discussions surrounding data focused on the following themes:

- **Ownership, control, and public value:** Funding and physical custody often determine practical ownership, but control over access may also rest with investors, boards, partners, or customers. Public investment creates a strong expectation that data generates public benefit.
- **Establish a data strategy early:** Decide who owns collected data, who controls access, what may be reused to train models, and what can be shared at reduced resolution or after a delay. Data rights may become a major source of value or a barrier to scientific and commercial partnerships.
- **Tiered access rather than all-or-nothing sharing:** Access should reflect purpose, sensitivity, timing, resolution, and security risk. Real-time or high-resolution data may remain restricted, while delayed, aggregated, anonymized, or lower-resolution products can support science and public use.

- **Shared infrastructure with differentiated rights:** Separate civilian and military observing systems are unlikely to be efficient and affordable. Common platforms, sensors, and datasets can serve multiple users when access rights and release conditions are clearly defined. A potential outcome is that data infrastructure designed for scientific purposes may need to evolve towards more secure systems in terms of cybersecurity, including data exchange and storage, secure transmission systems, etc.
- **Data as a commercial asset:** Proprietary datasets, metadata, AI-training rights, and derivative products can drive company value. Open data expectations should coexist with incentives to invest in specialized collection, enhancement, and services.
- **Progress on data sharing should begin with practical wins.** Rather than waiting for a comprehensive international agreement, it was recommended beginning with areas of broad agreement where data can be shared now. Early successes would build institutional capability and trust, creating momentum for wider cooperation despite geopolitical tensions. Data sharing requires detailed and simplified use cases.

International Scientific Collaboration

Increased defense spending can expand ocean-observing capabilities, platforms, and data collection, but the accompanying national-security focus may also constrain scientific and international collaboration by recasting research technologies as surveillance assets, increasing prior-notification and access requirements within exclusive economic zones, and limiting openness in sensitive regions such as the South China Sea and Southern Ocean. Participants emphasized that genuinely scientific dual-use activity should remain distinguishable from militarized operations and continue to follow international law and established norms for data sharing, including the principles reflected in the United Nations Convention on the Law of the Sea (UNCLOS), customary practice, and the Antarctic Treaty's requirement to share data collected south of 60 degrees. The central challenge is the gap between state-based obligations to support openness, the restrictions imposed by defense customers, and what industry can realistically deliver. Continued dialogue among governments, scientists, and companies will be needed to clarify responsibilities, preserve trust, and prevent security-driven investment from fragmenting global ocean partnerships.

Adjacent Industries

Participants identified several promising adjacent markets for ocean technology. The growing space-ocean nexus combines complementary satellite and *in situ* data, while advances in connectivity and artificial intelligence (AI)-enabled analysis are making previously niche applications commercially viable. AI changes the economics of niche applications by extracting multiple products and insights from data originally gathered for a larger defense, scientific, or infrastructure customer. For example, AI-supported analysis can help emerging ocean-bed activities reach sufficient commercial scale. Other near-term opportunities include ports and maritime transportation, where better data can improve navigation, logistics, infrastructure management, and operations, and insurance, where firms need stronger information to price climate, coastal, and infrastructure risks. Ocean-derived technologies and knowledge may also support health and biotechnology, while decarbonizing sectors require improved environmental monitoring, operational data, and verification.

Localized coastal forecasting offers another market because global and national models often lack the resolution and short-term accuracy needed near population centers and critical infrastructure. Better local observations could support coastal protection, emergency planning, and nearshore asset management. Demand is also expected to grow for deep-sea monitoring, biodiversity observations, and environmental impact assessments as frameworks, such as the Biodiversity Beyond National Jurisdiction (BBNJ) agreements, are created. Across these markets, the greatest transferable value lies in shared observing platforms, integrated physical, biological, and environmental data, and analytical capabilities that can serve multiple customers and uses.

While adjacent markets provide commercial diversification and resilience, there are also challenges for consideration. Oil and gas, offshore wind, dredging, research, and other markets rely on distinct customer networks, sales strategies, conferences, publications, and operating requirements. Because demand in any one of these markets can shrink abruptly, companies must remain agile enough to sustain relationships across several sectors and adjust their focus as conditions change. This diversification can improve resilience, but it also increases the commercial burden on resource-constrained companies.

Workforce

The workforce discussion shifted the emphasis on a fixed set of technical skills to developing broader, lasting capabilities. Rather than training solely for narrow specialties, the sector should cultivate adaptable professionals who can move across functions and collaborate effectively with experts inside and outside their organizations. Hands-on experience remains essential: student competitions, such as MTS's MATE and AUVSI's RoboNation, along with other applied-learning opportunities, expose participants to real-world failures, integration challenges, and the task of turning theory into practical solutions. Critical thinking, adaptability, entrepreneurial judgment, and cross-disciplinary collaboration may ultimately outlast any single technical specialty. The rapid evolution of coding, once considered a durable technical or "hard" skill, shows how quickly workforce needs can change.

Workforce needs vary by company stage and market. Early-stage firms often need versatile employees who can work across functions, draw on university or national-laboratory expertise, and make limited funding go further than conventional hiring allows. As companies move from design to production, demand shifts toward hardware engineering, manufacturing, embedded software, systems integration, and large-scale production management. A planned tenfold manufacturing expansion in Mississippi illustrated both the speed and scale of this transition and the difficulty of recruiting engineers in regions affected by substantial talent outmigration.

Success in dual-use markets further depends on understanding that commercial, defense, and scientific customers operate under fundamentally different assumptions. Commercial risk is often framed in financial terms; defense risk may involve human safety and mission consequences; and scientific risk centers on the integrity and availability of data. These differences shape contracting, acquisition, product use, and organizational decision-making. Companies therefore need people who can translate across these domains, understand the markets in which technologies operate, foster inter-sectoral collaborations and adjust quickly as technology, customer expectations, and procurement models change.

Open Session

The open session brought up commercial data purchases, whether startups truly have the option to remain dual-use, and how enhanced data can foster the growth of intermediaries.

Commercial Data Purchase

Participants emphasized that a government purchase of commercially collected data creates two distinct questions: public access and commercial licensing. Public access concerns whether an agency may curate and release the purchased observations for research, education, forecasting, and other public interest uses. Commercial licensing serves a different purpose: enabling providers to earn revenue from data and related products.

Commercial release of data varies across entities and geographical regions. For example, in the United States, NOAA, using public funds to buy commercial data to replace or supplement government-owned observing assets, has as a general policy to release as much of the data as possible with no restrictions on usage to foster the commercial enterprise. As increased ocean observing technologies and data are commercially available, there needs to be further discussions about how this data is handled. Further, open release through GOOS or similar frameworks can advance science and demonstrate a provider's capabilities, but it should not be treated as equivalent to a license for commercial exploitation. Even when a public entity's curated data are publicly available, providers may retain rights to sell real-time or higher-resolution feeds, specialized analyses, derivative products, redistribution rights, or data-as-a-service offerings. Contracts and licensing schemes should therefore distinguish public-release rights from permitted commercial uses and clearly define provider ownership, exclusivity, reuse, attribution, monetization of the data, and protections for premium products.

Constraints for Start-Ups

Start-ups described dual-use funding as constrained not by limited opportunity, but by capital, investor preferences, and organizational capacity. Participants viewed diversification as essential because demand can contract quickly across defense, oil and gas, offshore wind, research, and other Ocean Enterprise markets. Start-ups must therefore maintain a presence in several sectors and expect their sales mix to shift over time. Their central scaling challenge now is adapting quickly to defense demand. Although academic or commercial technologies may address clear operational gaps, military requirements are often classified or expressed in terms that commercial-first firms struggle to interpret. Lacking security clearances, dedicated defense teams, and resources to pursue poorly defined opportunities, startups rely on government customers or intermediaries to translate mission needs into practical requirements.

Potential for Intermediaries

Participants considered whether growing pressure on commercial and military organizations to share data could expand the market for intermediaries identified in the Ocean Value Chain. They discussed opportunities to establish data-sharing criteria across both sectors while recognizing challenges such as platform ownership and differing customer requirements. They also asked whether the Ocean Enterprise is mature enough to share platforms and sensors that collect data

for multiple customers, like a ride-sharing model. Industry could help enable this approach because companies already serve multiple customers.

Potential Pathways

This is the first dialogue in the *Dialogues with Industry - Accelerating the Ocean Enterprise in Future Markets* series. Below is an initial list of potential pathways forward. The potential pathways from all the dialogues will be synthesized in a final summary paper for the series.

- **Develop greater awareness of the impact of safety technologies on ITAR restrictions.** Amplify existing efforts to decouple safety technologies with ITAR restrictions as has been done in other industries. Develop concrete suggestions and identify where and how to bring them forward.
- **Protect civilian market pathways.** Require dual-use programs to identify civilian applications, public and/or environmental benefits, technology-transfer opportunities, and continued commercial availability when projects are initiated to achieve long term sectoral growth.
- **Monitor the balance of investment.** Track whether defense funding is expanding the overall ocean-technology market or redirecting capital, talent, and production away from civilian and scientific uses.
- **Clarify the defense operating model.** Indicate early whether platforms will be treated as disposable, periodically replaced, or maintained and upgraded, so companies can plan product design, production capacity, and revenue models.
- **Identify and promote standardization.** Expand existing data standard discussions to include identifying areas where research, commercial, and defense can agree and share similar requirements, which could include the adoption of tiered data models.
- **Use the space sector as a model.** Convene a focused discussion between the space-sector and Ocean Enterprise stakeholders to identify lessons from defense-driven growth in the space sector and apply them to accelerate the Ocean Enterprise.
- **Invest in transferable workforce capabilities.** Expand hands-on programs that build systems integration, manufacturing, embedded software, critical thinking, adaptability, and cross-disciplinary and inter-sectoral teamwork.

Appendix 1: Participants

Sector	Affiliation	Name
Private/ For Profit	S2G Investments	Kate Danaher
Private/ For Profit	Seatrec Inc.	Yi Chao
Public/Not For Profit	Center for Naval Analyses (CNA)	John Schaus
Private/ For Profit	Investable Oceans	Ted Janulis
Private/For Profit	Indico Capital VC	Andre de Almeida Santos
Private/For Profit	Chance Maritime Technologies	Michael Scherer
Private/For Profit	Kongsberg	Nils Waltré
Private/For Profit	Noetronis	Ikram ElHarti
Private/For Profit	Nortek Group	Dave Velasco
Private/For Profit	Price Water Cooper	Catherine Frideres
Public	European Commission	Iain Shepherd
Academia	Marine and Antarctic Law and Policy Institute for Marine and Antarctic Studies University of Tasmania	Indi Hodgson-Johnston

Appendix 2: Use Case: Impacts of Dual-Use on Ocean Technology

Introduction

The Ocean Enterprise¹ is growing in recognition and is grounded in robust engagement and partnerships among the public, private, and academic sectors. The fourth series of the *Dialogues with Industry* (hereafter *Dialogues*), focusing on accelerating Ocean Enterprise Growth in Future Key Markets, consists of three curated dialogues that will be held September – November 2026. The *Dialogues – Accelerating Ocean Enterprise Growth in Future Key Markets* will explore and define the market dynamics, including barriers and opportunities, for maturing the public/private/academic partnership, capability, and capacity to support the growing societal need for delivery of actionable, fit-for-purpose ocean data, and information. The *Dialogues* are less focused on technical and scientific discussions, except as they influence the market dynamics.

The Ocean Enterprise Initiative is a global effort that spearheads innovation, thought leadership, and economic development within the Ocean Enterprise. It is led by the Marine Technology Society (MTS), Global Ocean Observing System (GOOS), National Oceanic and Atmospheric Administration (NOAA), and Kongsberg Discovery. The first [Dialogue](#) explored how to mature the Ocean Enterprise to deliver essential societal, economic, and environmental benefits. The second [Dialogue](#) focused on Harmful Algal blooms, understanding opportunities for sensor and platform development, increasing demand for downstream services, and advancing control mechanisms. The third [Dialogue](#) focused on Ocean Observing of the Future and concluded that incremental advancements are not enough; instead, a transformative approach is necessary to align technology, market forces, and community needs.

This Use Case outlines the scope, format, and proposed discussion topics for Ocean Enterprise Growth in Future Key Markets – Dialogue 1.

Background and Scope

The Ocean Enterprise is an ecosystem or domain that functions as a **portfolio of sectors and markets** of varying sizes and degrees of maturity. While the term "Ocean Enterprise" describes a cohesive domain or business cluster, its individual components range from established industrial sectors to emerging niche markets. This series will focus on markets at different levels such as:

- **Mature "Legacy" Markets:** These stable markets include the manufacture and sale of established observing technologies and are characterized by high sales volumes and established economies of scale, allowing fixed costs to be spread across many units.
- **Developing "Growth" Markets:** Markets focused on the production and delivery of specialized observations and information products are often less mature. Examples include verification data for blue carbon credits or offshore wind site assessments, where sales volumes and economies of scale are still expanding.

¹ The term "Ocean Enterprise" refers to the public, private and academic entities and activities involved in ocean observation, measurement, and forecasting ([Ocean Enterprise Initiative Roadmap](#))

- **Nascent "Frontier" Markets:** These emerging markets often target highly specialized needs for data or information. Many of these markets could be characterized as "micro-markets;" they currently suffer from low sales volumes and high average costs. The financial viability of micro-markets can be improved by adopting interoperability standards or "market bundling" that modify goods and services to meet the requirements of multiple user groups simultaneously.

Often the Ocean Enterprise is described as being a domain of **Fragmented Markets** characterized by instruments or data products that are hyper-specialized for a narrow set of buyers; average costs can become prohibitively high, hindering market viability. Further, the Ocean Enterprise, and ocean technologies/products and services are invisible and therefore potentially considered non-viable. Market viability refers to the ability of a market to sustain itself financially, ensuring that sales cover both fixed and variable costs while generating a profit. Understanding this concept is crucial for evaluating the potential success of ocean-based observational technologies.

An important goal of the fourth *Dialogues* is to identify strategies to overcome fragmentation, allowing for economies of scale that support sustainable market growth.

The first in the series will focus on dual-use, defined as the same ocean technology, data, or infrastructure that can support both civilian applications and defense or security missions. The shift toward defense is no longer hypothetical. It is already reshaping ocean technology markets, investment priorities, procurement pathways, workforce dynamics, and the balance between scientific, commercial, and military applications. This dialogue will explore the areas of common interests and potential tension of dual-use.

The global ocean observing system, which has built over 50 years of international scientific cooperation including the Argo float network, the Global Ocean Observing System, cooperative research vessel programs, remains underfunded and fragmented. Meanwhile, defense spending on the same physical domain is growing at double-digit annual rates. Technologies are converging, but the funding is diverging. Will the geopolitical landscape push ocean observing from a shared global common toward a contested, securitized battlespace — with each major power building its own proprietary picture of the ocean rather than contributing to a shared one?

Dialogues Outcome

The goal of the *Dialogues* is to raise awareness and conduct a stock-taking of the trajectory of the global ocean observing community, focusing on services for data delivery and the generation of enhanced predictions and forecasts that are sustainably funded through collaboration between the public and private sectors. The main output of the *Dialogues* is a set of **actionable recommendations** to advance the Ocean Enterprise.

Format of the Dialogues

The dialogue is organized into the three sections described below. Each section examines shared challenges and emerging opportunities in advancing the commercial market for observing platforms, understanding drivers and barriers to demand, and better aligning public and commercial observing networks. The facilitator will briefly introduce each section and lead a discussion with the expert participants using the questions provided. These questions are intended to draw out a range of perspectives and generate actionable recommendations. The

facilitator may ask follow-up questions to deepen the discussion. Observers may contribute through the chat function and will be invited to join the conversation during the final 30 minutes.

Section I – Understanding the Impact of Dual-Use on the Ocean Enterprise

Dual-use technologies are technologies that can serve both civilian and military purposes. In many cases, the primary use may be civilian, scientific, or commercial, for example, supporting everyday operations, environmental monitoring, or commercial services, while a secondary use may be adapted for defense needs such as surveillance or maritime domain awareness. Given the current geopolitical landscape, ocean technologies are increasingly being reconsidered not only as tools for science and commerce, but also as capabilities with direct defense relevance.

There are historical precedents for defense investment supporting innovation in ocean technologies, including hydrographic surveying and autonomous glider development. In the past, this defense-related investment was often matched by strong funding for ocean research. The current landscape is different. There are now far more commercial ocean technologies, and it is the case that innovation is increasingly flowing from the commercial and civil sectors into defense, rather than only from defense into civilian applications (e.g. drones, robotics, Artificial Intelligence (AI), and autonomous systems).

This shift is occurring alongside increased defense and maritime-sector spending. For example, Europe is deliberately building a dual-use maritime technology strategy, not just seeing accidental overlaps between civilian and military uses. European Union research funding and defense cooperation are converging around maritime and underwater technologies, with European Defense Fund allocations rising and programs like ETLAT II supporting acoustic systems useful for both ocean monitoring and submarine detection. Allocations for research and technology cooperation reached approximately €255 million in 2024, rising from €239 million the prior year, with projections of €367 million by 2027.² A substantial share targets maritime and underwater technologies with explicit dual-use applications. Australia plans to spend between A\$425–560 billion, roughly US\$303–399 billion, on defense capabilities over the next decade, including AUKUS commitments, long-range weapons, underwater capabilities, surface ships, and drones. Maritime capability accounts for around 41% of the total investment program. China is also fusing civilian research institutions, state-owned industry, and military programs through its civilian-military fusion strategy.

At the same time, funding for civil ocean observing systems is under pressure. The Global Ocean Observing System 2025 Status Report warns that, without stronger coordinated investment and more diversified partnerships, the civilian ocean observing system “remains subcritical and at risk.” Major cuts have also been proposed for United States civilian agencies that support ocean observing and research. For example, the United States President’s Fiscal Year 2026 budget includes a 27% decrease in NOAA’s overall budget, with proposed elimination of the U.S. Integrated Ocean Observing System (IOOS) regional associations, and an 80% decrease for National Science Foundation’s Ocean Observatories Initiative.

While the defense demand has emerged as a central driver of ocean technology, its long-term significance remains uncertain. Increased military and public-sector spending are creating new opportunities for startups, scale-ups, manufacturers, and component suppliers, especially in areas such as autonomy, underwater communications, edge computing, miniaturized sensing, gliders, profiling floats, drones, and ocean data services. This demand could help move ocean

² European Defence Agency. Defence Data 2024–2025. Brussels: EDA, 2025. Available at: https://eda.europa.eu/docs/default-source/brochures/2025-eda_defencedata_web.pdf

technology from research prototypes and one-off deployments toward manufacturing and mass production, strengthening supply chains and workforce development. It could also bring investment into a sector that has historically been niche and underfunded by venture capital. At the same time, there is reason for caution: defense spending will not automatically benefit the broader ocean economy, national security ecosystems may not have the spending power or scaling effect often assumed, and in some cases commercial investment may drive national security capability more than the reverse.

This paradigm shift also creates risks. Companies may redirect already limited resources toward defense customers, potentially reducing support for scientific, environmental, and civilian markets. A key question is whether increased defense activity will accelerate innovation across the Ocean Enterprise or instead delay, crowd out, or reshape civilian ocean observation, science, climate, conservation, and commercial applications.

Discussion Topics

1. How are geopolitical pressures, defense spending, maritime security needs, venture capital, procurement behavior, and commercial technology advances influencing companies, researchers, and investors?
2. What regulatory or access barriers could emerge as ocean technologies become more clearly dual-use? For example, could export controls, International Traffic in Arms Regulations (ITAR) restrictions, classified requirements, or procurement rules affect technologies that were previously open or commercially available?
3. Can military, commercial, scientific, and environmental markets grow together, or will one market expand at the expense of the others? What would a healthy balance across these markets look like?
4. How can military driven investment strengthen the broader Ocean Enterprise rather than only serving national security needs? What mechanisms would help ensure that defense spending also supports civilian, scientific, environmental, and commercial users?
5. How long might civilian users experience delays or reduced access if resources shift toward military customers—two years, five years, eight years, or longer?
6. How might an increased military alignment reshape ocean science and public research priorities? Could it affect publication openness, international collaboration, data sharing, or the ability of public agencies and universities to pursue independent research agendas?
7. How durable is the current shift toward defense demand?

Section II – Startup Scaling, Defense Procurement, and the Future of Dual-Use Ocean Technology

Defense departments are under increasing pressure to innovate more quickly and shorten the time required to bring new capabilities into operational use. Rather than waiting for years for traditional acquisition cycles to deliver new technologies to the battlespace, defense departments are actively looking to emerging technologies to respond to a rapidly changing threat landscape. This has helped drive a significant influx of funding into the startup sector, particularly in defense technology.

In the United States, this shift is visible in venture capital activity. As of Q2 2025, venture capital investment in defense technology had already reached \$28.1 billion, surpassing the full-year 2023 total. By the end of 2025, private venture capital defense technology deals reached \$48.5 billion, nearly double 2024 levels. However, participants cautioned that there is still not enough data to know what long-term impact this level of venture capital funding will have on the sector.

The rise of startup and venture capital dynamics creates both opportunities and pressures for the Ocean Enterprise. Startups may be pushed to scale quickly and “pick a lane,” potentially moving strongly toward defense if that is where the money is. Some companies may choose to shift heavily toward defense markets, while others may have enough commercial opportunities to avoid national security customers, or may choose not to pursue defense work for moral or philosophical reasons. At the same time, startups and investors may benefit from maintaining a mix of defense, commercial, scientific, and environmental applications rather than moving entirely into one market, especially long-term resilience.

Startups also face major barriers when entering defense and public procurement markets. Are startups equipped for large public procurement processes? They may lack administrative teams, compliance capacity, after-sales service infrastructure, and governance structures needed to handle large contracts in general and large military contracts in particular. Small companies also face marketing and business-development challenges because defense, scientific, and commercial markets often require separate events, relationships, and sales channels. For these reasons, acquisition reform will be central if ministries of defense are expected to drive scale in the Ocean Enterprise. Participants noted that the gap between Research and Development (R&D) funding and programs of record—the “valley of death”—remains large. Venture-backed defense investment may help some companies cross that gap, but it is still unclear whether the current surge in funding will produce durable long-term returns or create a more resilient, diversified ocean technology ecosystem.

The business model will affect the outcome. Dual-use potential varies depending on whether companies are primarily military, commercial, or genuinely dual-use; whether they sell hardware, software, platforms, or data-as-a-service; and who owns or operates the systems and data. These choices may affect how easily value can move between defense and civilian markets. Company-owned systems that sell data to government customers may create different opportunities and risks than government-owned and operated systems, particularly for data access, revenue models, and long-term market flexibility.

The technology landscape itself is also highly interconnected. Autonomy, sensing, communications, AI, robotics, platforms, data infrastructure, and operational services are developing together, making it unlikely that any one’s capability can mature fully without progress in the others. This interdependence may create opportunities for broader ecosystem growth, but it can also deepen fragmentation if investment, procurement, and standards evolve separately across defense, commercial, scientific, and public-sector markets.

Fragmentation is therefore both technical and political. It stems not only from niche technical requirements, but also from national security concerns, the protection of national champions, export restrictions, procurement structures, and differences between European and U.S. market dynamics. Countries may protect domestic companies or technologies when they view them as important to national security, which could shape how dual-use ocean technologies scale across borders.

Discussion Topics

1. Will venture-backed defense investment reduce or deepen fragmentation across the Ocean Enterprise? Could it create common standards, shared platforms, and economies of scale, or will national champions, export restrictions, and separate defense/commercial/science markets make fragmentation worse?
2. How is the rise of venture-backed defense technology changing the Ocean Enterprise's innovation pathway?
3. What shifts are emerging in risk tolerance, speed of development, expectations for scale, and investor pressure on companies to "pick a lane"?
4. How are startup business models shaping dual-use opportunities and risks? What capabilities do startups need to succeed in defense and public procurement markets?
5. How should companies balance defense, commercial, scientific, and environmental markets over time? What are the risks of moving too heavily toward defense customers, and what does a resilient dual-use portfolio look like?
6. What barriers prevent startups from moving from R&D funding to durable programs of record? Are current acquisition and procurement pathways fast enough, and what reforms are needed to help small firms survive the "valley of death"?
7. Is the current surge in defense-focused venture capital likely to be durable? What evidence would show whether this investment wave is producing long-term returns, scalable companies, and a stronger ocean technology ecosystem?

Section III – The Wider Impact of Dual-Use Ocean Technology: Market Expansion, Data Concerns, Workforce Growth, and Wider Impact

Defense strategies are increasingly focused on strengthening the resilience of critical maritime infrastructure, including gas pipelines, undersea cables, ports, offshore energy assets, and liquefied natural gas terminals. This emphasis is also driving interest in common requirements for surface and underwater technologies, including interoperable uncrewed systems that can monitor critical maritime infrastructure. If these requirements are developed in ways that support multiple users and missions, they could expand the marketplace for ocean technologies beyond defense alone.

Distributed network approaches are also beginning to shape defense thinking. One example is mosaic warfare, an emerging concept in which many smaller, lower-cost crewed and uncrewed systems are combined into flexible, distributed force packages rather than relying on a few highly specialized platforms. Applied to the ocean context, this could translate into distributed systems, modular architectures, scalable autonomy, lower-cost experimentation, rapid iteration, and resilient networks. Such networks could include uncrewed underwater vehicles (UUVs), maritime drones, seabed sensors, communications nodes, and software working together in adaptable mission packages. Over time, capabilities developed for this model could also accelerate commercial applications in offshore energy, telecom infrastructure, environmental monitoring, and other ocean markets.

At the same time, the growing military value of ocean data raises questions about openness, ownership, and access. Seabed 2030, for example, is a collaborative effort to openly map the ocean seafloor. As nations deploy new research vessels and sensors to map subsea environments, there may be increasing concern that data with national security value will no longer be shared as openly. If a mission begins as civilian research but is later viewed as

contributing to defense, the implications for data sharing, international cooperation, and public access could be significant.

These concerns are especially important because national security demand for ocean observational data is rooted in operational needs such as mine warfare, anti-submarine warfare (ASW), and maritime domain awareness. Systems such as Argo floats and moored buoys, originally developed for scientific research, now occupy a legal and operational gray zone in which data collected for scientific purposes can also have national security implications. Once a scientific platform is adopted or interpreted as serving national security purposes, it may affect how the platform is governed, how the data are shared, and how other nations perceive its deployment.

There are workforce and supply-chain implications. Defense growth may attract talent and investment into ocean technologies, potentially strengthening the sector over time. However, near-term competition for specialized labor and production capacity could create bottlenecks, like competition for welders and shipbuilding capacity across naval and commercial shipbuilding.

Discussion Topics

1. Where should the boundaries exist between civilian science and defense applications?
2. Who owns and controls critical ocean data and infrastructure in a dual-use ecosystem? What are some of the differences?
3. Does the Ocean Enterprise have the workforce capacity to support simultaneous growth in defense and commercial demand? What new skills will become most critical in a dual-use future?
4. How does increased national security focus affect international scientific collaboration and global ocean partnerships? What type of access restrictions will result, e.g., will partner nations restrict access to their Exclusive Economic Zones if they perceive autonomous scientific gliders as surveillance assets.
5. Which adjacent industries are best positioned to benefit from dual-use ocean technologies? Examples are offshore energy, telecom infrastructure, climate monitoring, ports/logistics, fisheries, disaster response, or critical seabed infrastructure.
6. Concepts such as “mosaic warfare” envision distributed networks of lower-cost manned and unmanned systems operating collaboratively rather than relying on a few highly specialized platforms. How might this approach reshape ocean technology development, acquisition, and commercial adoption?

Appendix 3: Planning Team

Sector	Affiliation	Name
Intergovernmental	GOOS	Oren Pasqueron De Fommervault
Intergovernmental	GOOS	Emma Heslop
Private/For Profit	Kongsberg Discovery	Peer Fietzek
Private/For Profit	TBD Economics	Jeff Adkins
Public	NOAA/GOMO	Jessica Snowden
Public	NOAA/GOMO	Katie Robinson
Public	NOAA/IOOS	Zack Baize
Private/Not for Profit	MTS	Hans VanSumeren
Private/Not for Profit	MTS	Hadley Clark
Private/Not for Profit	MTS	Adrienne Copeland
Private/Not for Profit	MTS	Donna Kocak
Private/Not for Profit	MTS	Zdenka Willis

Dialogues with Industry Fourth Series

Accelerating Ocean Enterprise Growth in Future Key Markets: Impacts of Dual-Use on the Ocean Enterprise

Report Out from Dialogue 1

For bibliographical purposes, this publication should be cited as follows:

Ocean Enterprise Initiative (2026) Dialogues with Industry – Accelerating Ocean Enterprise Growth in Future Key Markets: Impacts of Dual-Use on the Ocean Enterprise – Dialogue 1 Report Out (Report no. MTS-202602)