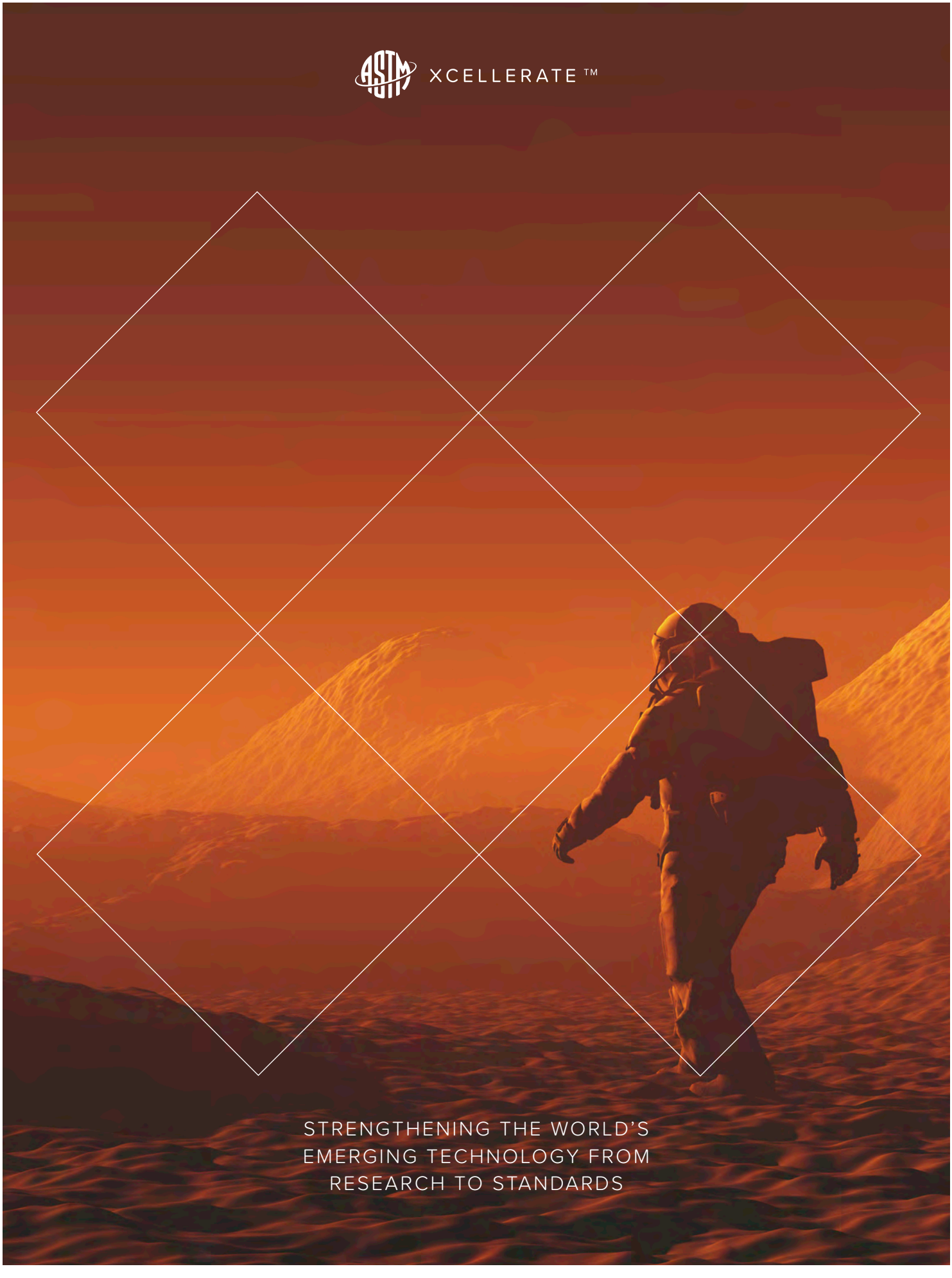
XCELLERATE ™



STRENGTHENING THE WORLD'S
EMERGING TECHNOLOGY FROM
RESEARCH TO STANDARDS

FIT FOR AN EXCITING FUTURE

At ASTM International we have a bold ambition. We want to put standards at the heart of the world's emerging technologies – promoting excellence, accelerating development, and underpinning commercial success.

Many brilliant concepts get stuck in the void between innovation and full-scale production – with multi-billion US$ cost implications. Incorporating standards from the start of the development cycle transforms this dynamic – ensuring that exciting advances can quickly demonstrate their safety, reliability, quality, and relevance.

ASTM Xcellerate™ is the way we are turning our ambition into action. It's seen us creating 'Centers of Excellence' in fields like additive manufacturing and exo technologies as we build new, international partnerships and initiate critical, early-stage research. It's also seen us exploring the needs of other emerging technologies like unmanned aircraft systems, and robotics and automation.

Across all these areas we are building on a world-leading standards development process – recognized by the OECD – to provide the speed and agility new technologies urgently need.

Emerging technology has the potential to radically change industries for the better. ASTM Xcellerate™ will help to see this potential realized – putting standards at the heart of an exciting future.

AN ADDITIVE MANUFACTURING FACILITY

ENABLING COLLABORATION FOR A NEW ERA

ASTM Xcellerate® takes this capability into a new era – harmonizing the needs of international research communities and embedding standards at the very start of the emerging technology process. As the OECD recently stated: “ASTM International’s bottom-up approach to standards development and a streamlined process allow the organization to facilitate standard-setting action in new market areas.”

With participation from industry, research hubs, regulators, academics, and governments around the world, we are inviting partners to move forward with us – exchanging ideas, initiating critical research, and leading development of new, agile standards to meet the demands of our digital age.

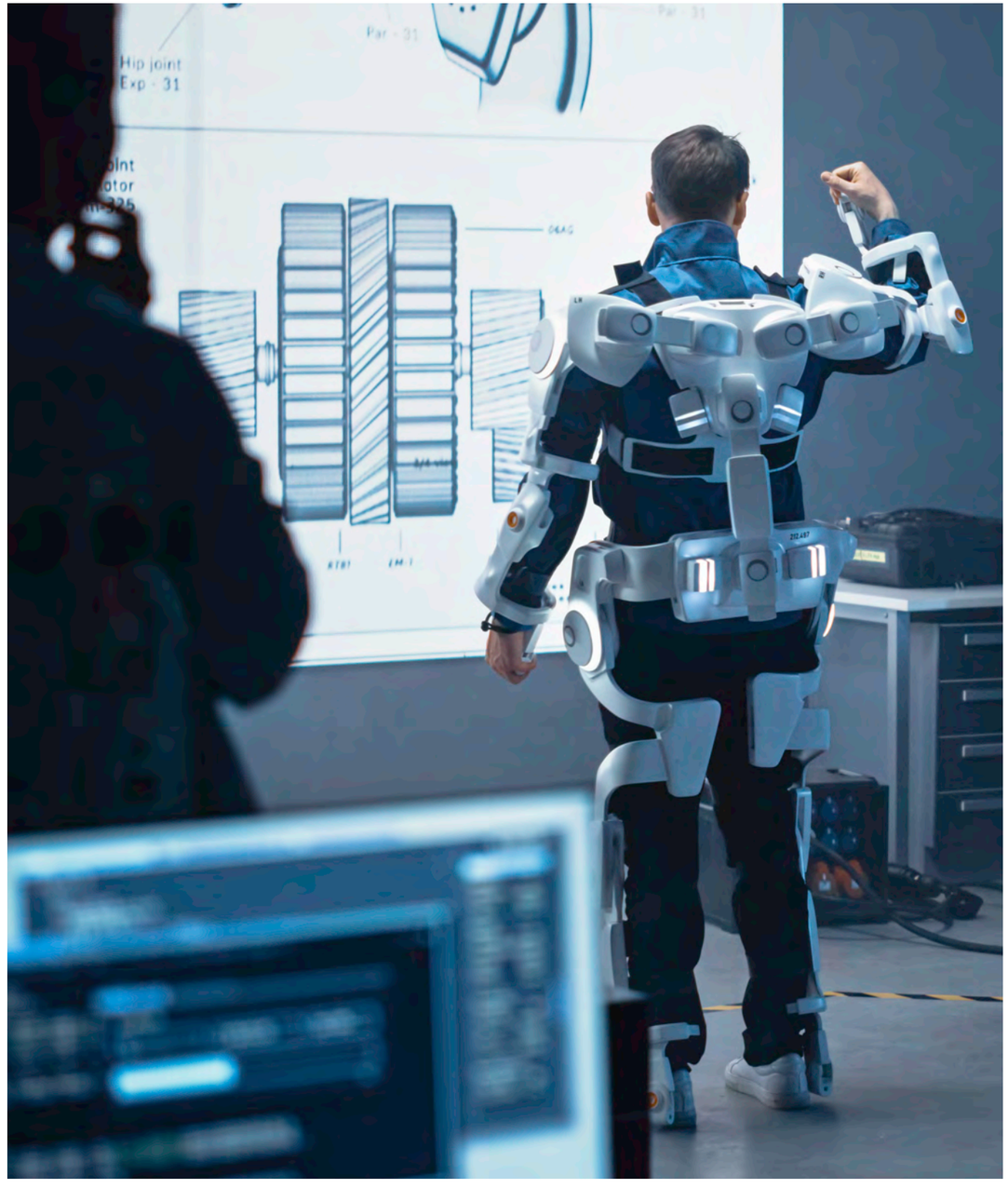
Standards are critical to building trust and sustained success for any technology. At ASTM we’ve long known how to shape them – creating collaborative, global platforms that ensure the right balance between IP and shared knowledge.

The ultimate goal of R&D teams around the world is to move from concepts to full commercial success as quickly and cost effectively as possible. ASTM Xcellerate™ has been created to help innovators do just that – providing the means to demonstrate safety, reliability, quality, and relevance across a wide range of emerging technologies.

ACCELERATING COMMERCIALIZATION. REDUCING COSTS.

To achieve this goal, Centers of Excellence in areas like Additive manufacturing and exo technology deliver targeted, early-stage research into critical standards needs. Our gap analysis of current standards ensures that existing standards are fully utilized. Meanwhile, dual development of technology and standards roadmaps ensures both paths are constantly aligned.

Our goal throughout is clear: less duplication of effort, fewer wasted resources, and reduced delays in testing, qualification, and certification – helping transformative innovations achieve commercial success as swiftly and efficiently as possible.



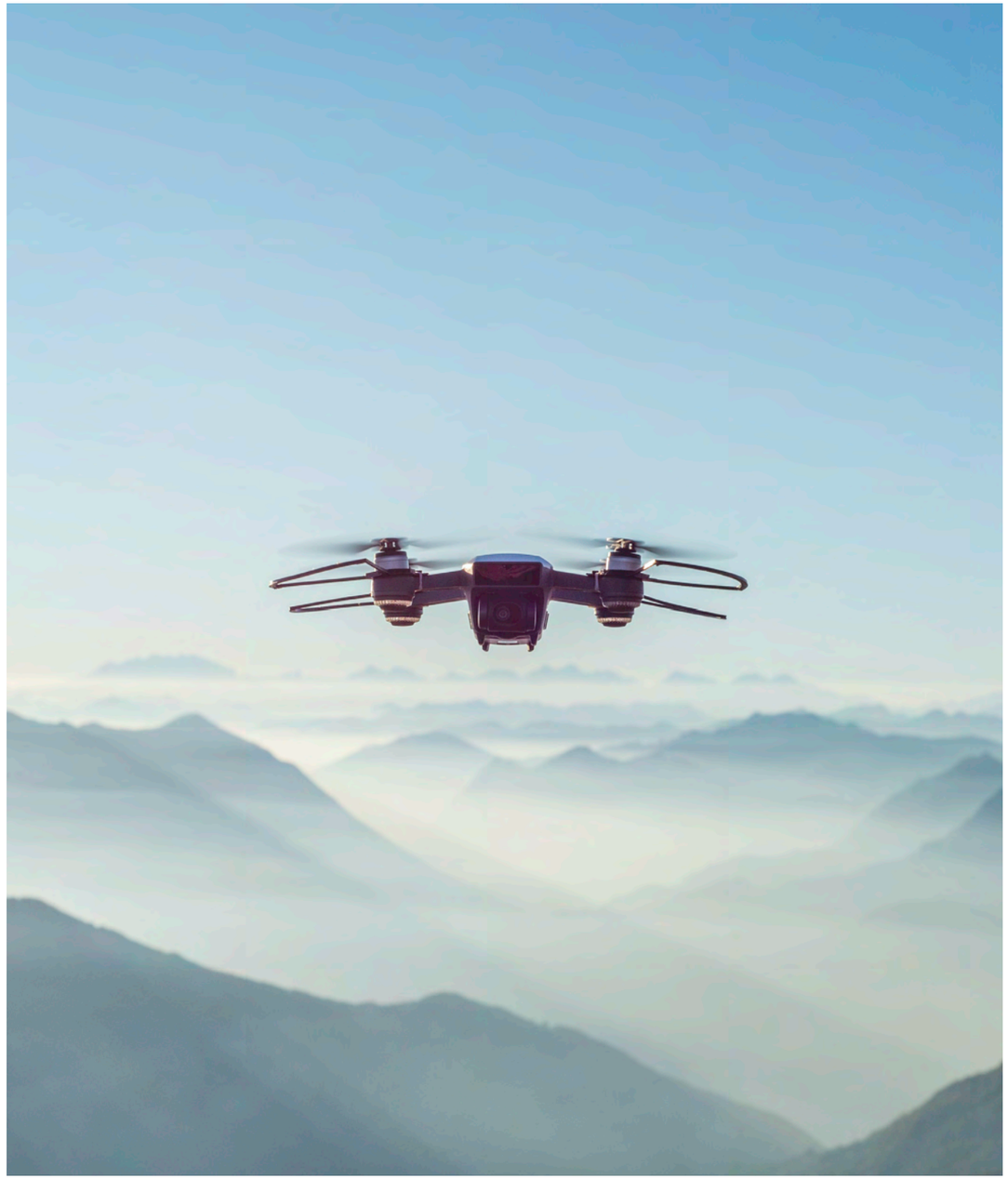
BRIDGING THE GAP TO SUSTAINED SUCCESS

Across all emerging technologies, there's a huge divide between research and full-scale operation. This 'valley of death' sees many exciting innovations marooned for years – even decades – struggling to demonstrate full commercial viability and constantly soaking up millions in funding.

ASTM Xcellerate® aims to bridge this divide. Rooted in a world-leading voluntary standards process that's recognized by the OECD, its driven by industry and key stakeholders, with relevance built in. Critically, it sees ASTM taking proactive steps to ensure that standards keep pace with rapid advances in technology.

Most importantly, with standards integral to R&D from the very start, it enables new technologies to clearly demonstrate safety, consistency, and durability at scale. Saving time, reducing costs, and accelerating development – Xcellerate helps to bridge the gap to sustained commercial success – however advanced the technology.

UNMANNED AIRCRAFT (DRONE) TESTING



THE XCELLERATE PILLARS

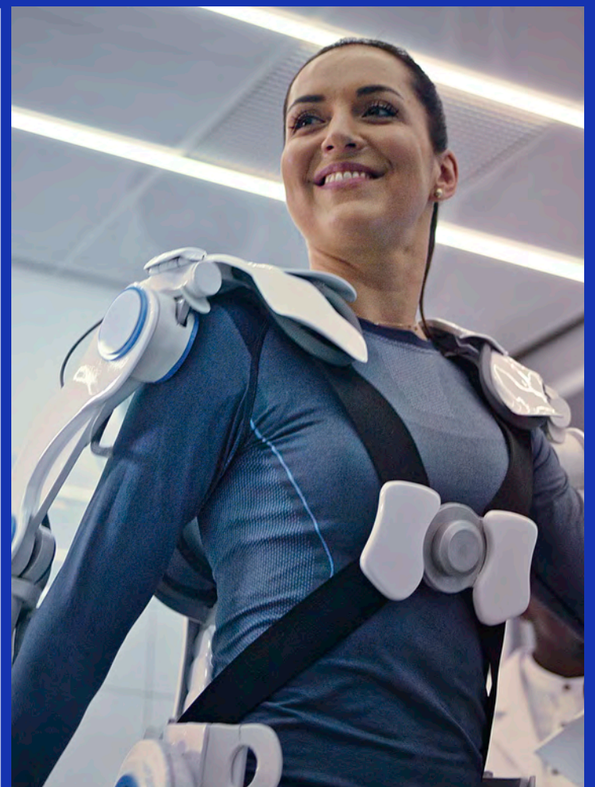
XCELLERATING PROGRESS ACROSS EMERGING TECHNOLOGIES

ASTM Xcellerate™ is built around four pillars. These pillars are designed to meet the needs of industry, research hubs, regulators, academia and governments as they explore the benefits standards can bring to emerging technologies around the world. Our four pillars are:

- CENTERS OF EXCELLENCE
- TECHNICAL EXPERTS
- MARKET INSIGHT
- ADVISORY SERVICES

CENTERS OF EXCELLENCE

Our Centers of Excellence conduct strategic R&D that enables different emerging technologies to make better use of standards to drive-up quality and accelerate commercial success. At present, there are two operational Centers – additive manufacturing and exo technologies – with a number of others at various stages of exploration and development.



The Centers see ASTM partnering with industry, research hubs, regulators, academics, and governments from around the world to provide three core elements:

– coordinated R&D to support faster standards development
– programs and services to support workforce development and training
– strategic guidance and funding – geared towards the needs of each technology

Additive manufacturing, our first Center, focuses on four primary pillars; Research and Development, Education and Workforce Development, Industry Consortia, and Advisory Services. The Center's team, advisory board, and stakeholders support these activities and future developments.

The Additive manufacturing Center of Excellence is a prime example of ASTM Xcellerate® taking practical steps to help game-changing technologies realize their full potential.

TECHNICAL EXPERTS

Historically, we have relied on our outstanding membership to provide technical expertise across the vast array of products, services, and technologies ASTM covers. That's still the case for emerging technologies, but to increase our strength and focus in these areas we have also recruited technical experts in these specific fields:

- ADDITIVE MANUFACTURING
- EXO TECHNOLOGIES
- UNMANNED AIRCRAFT
- EMERGING AIRSPACE TECHNOLOGIES

All these experts have a huge depth of knowledge and experience in their field. Our aim is to assess the need to engage experts in other emerging technologies in the next 12 months and beyond.

Our technical experts fulfill a number of roles. They actively engage with industry and stakeholders around the world, looking particularly at their long-term goals and current priorities. They explore new kinds of collaborative models that will help ASTM Xcellerate® create impact in specific technology fields. They also provide insights and thought leadership through a program of conferences, workshops, panels, and webinars. Finally, they act as a key link between their respective technology and the rest of ASTM, ensuring that all our Xcellerate activities are coordinated to best effect.

MARKET INSIGHT

Stakeholders across all emerging technologies require market insight that is authoritative, independent, and above all, timely. In 2021, ASTM acquired Wohlers Associates to provide this service as part of the wider ASTM Xcellerate® proposition.

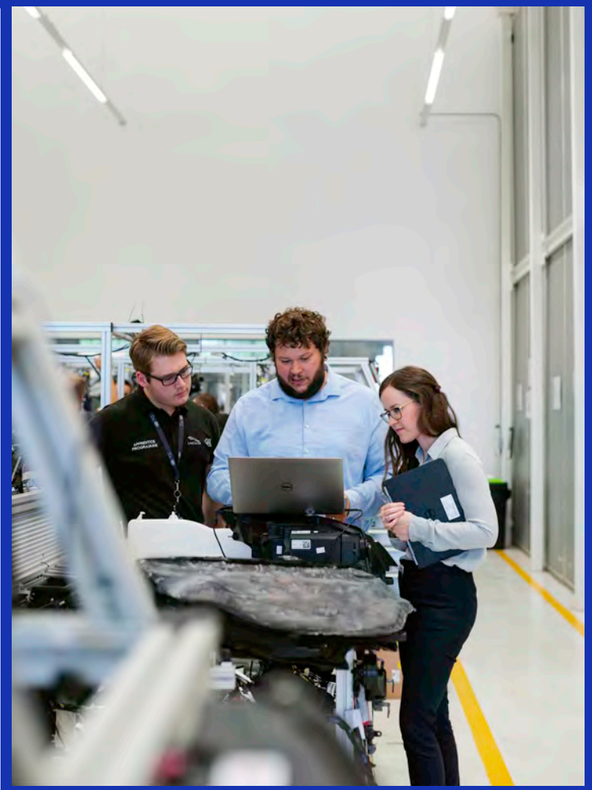
For 26 years, the Wohlers Report has been the definitive market intelligence publication for the additive manufacturing and 3D-printing industries. Drawing from an unrivaled global network, the report includes contributions from a myriad of authors around the globe. It contains a wealth of detailed information on AM developments, along with data, and trend lines spanning more than 30 years. The business is now operating as Wohlers Associates, powered by ASTM International.

As part of Xcellerate, the Wohlers Report will continue to offer an unparalleled view of developments in additive manufacturing. Similar publications based on Wohlers' established methodology are planned for other emerging technologies.

As part of our wider Advisory Services, the Wohlers team also offers bespoke market insight consultancy to clients in the additive manufacturing sector and beyond.

ADVISORY SERVICES

Bridging the gap between R&D and sustained commercial success by harnessing standards to optimum effect can be complex and challenging for those working in emerging technologies. Events move quickly, and established processes don't always apply. For this reason, we offer Advisory Services to organizations to help them make rapid and effective progress.



AREAS WE TYPICALLY COVER INCLUDE:

– Technical and strategic consulting on new developments and trends (drawing on the expertise of Wohlers Associates – see Market Insight)
– Roadmapping (often aligning technology and standards roadmaps)
– Product development workshops and liaison
– Bespoke analysis and technical reports – often impacting investment or M&A decisions

XCELLERATE TECHNOLOGIES

ASTM Xcellerate™ currently covers four primary technologies: additive manufacturing, exo technologies and emerging airspace, and robotics and automation. In the coming years, the aim is to include other exciting technologies where ASTM's 'research to standards' approach can add real value.

ADDITIVE MANUFACTURING

EXO TECHNOLOGIES

EMERGING AIRSPACE

ROBOTICS AND AUTOMATION

ADDITIVE MANUFACTURING

Additive manufacturing is transforming industrial production. Predicted to be worth $79 billion by 2028, the global AM sector is seeing industries from aerospace and automotive to medical devices and construction benefit from new cost-effective and sustainable production methods.

HOUSES BUILT USING 3D PRINTED CONCRETE

FLEXIBLE WALL STRUCTURES IN 3D PRINTED CONCRETE

Yet significant barriers to adoption remain, including education and workforce development, and standards and certification. Targeted activity through ASTM International's AM Center of Excellence (CoE) is helping to remove these barriers, supporting growth and further innovation.

Following a strategic roadmapping exercise, the CoE has initiated research projects to close standards gaps in diverse topics from AM data, feedstock, process qualification, in-situ monitoring, inspection, and testing. One such project, to develop qualification procedures for laser beam powder bed fusion processes, could help to reduce risk factors in manufacturing everything from rocket propulsion components to orthopedic devices.

AM education and training is a further key strand of the CoE's work. Leveraging expertise from industry, academia, and government, the CoE is creating and delivering a wide range of courses and events to support the AM community. These include cybersecurity training, where cutting-edge research into cyber threats and counter-measures are being translated into practical knowledge and skills for the industry.

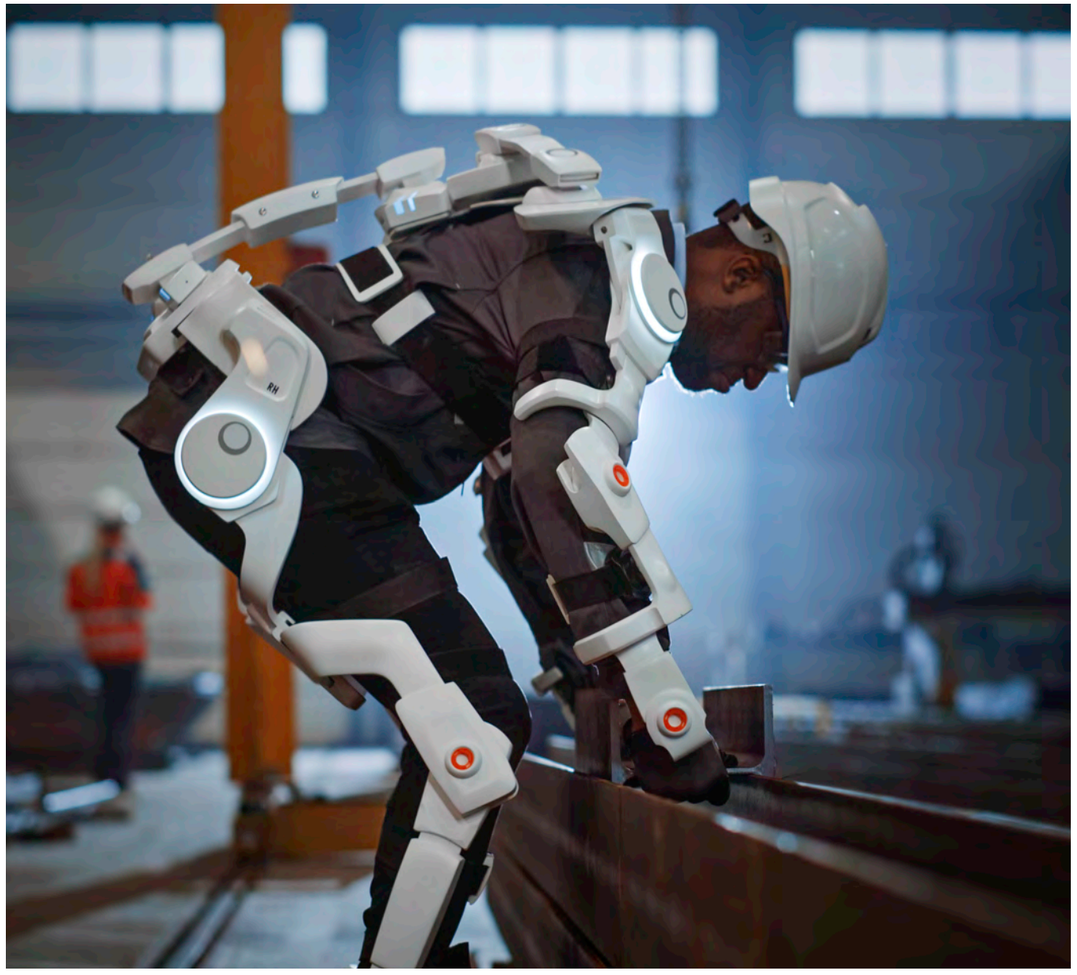
The CoE bolstered its capacity last year with the acquisition of Wohlers Associates, adding market intelligence and strategic advisory services to its offering. It's a combination that promises to further accelerate the global adoption of AM to the benefit of many industries and consumers.

EXO TECHNOLOGIES

Rapid advances in exo technologies have sparked interest among innovators across multiple industries. With the potential to reduce injuries and fatigue in the workplace, pioneers are seeing benefits from improved wellbeing and quality of work to reduced costs of worker compensation. Meanwhile, medical devices are offering both rehabilitation and everyday mobility gains to people suffering from disabilities, illnesses, or injuries.

EXOSKELETON SUIT DEVELOPMENT

EXO TECHNOLOGY IN MANUFACTURING



With such enormous opportunity, the incentives to bridge existing gaps between innovation and mass-market adoption are also huge. ASTM International's Exo Technology Center of Excellence is taking a strategic role to accelerate efforts that will see more individuals and businesses start to benefit from these devices.

For individual companies, the costs of qualification and testing can be prohibitive. However, the Exo Technologies Center of Excellence is supporting collaborative approaches to research and standards development, such as a project to investigate whether exo skeletons can protect workers during a return-to-work period after injury. Specialized education and certification are also being developed through the Exo Technologies Center of Excellence in partnership with organizations like the Laborers' International Union of North America (LiUNA).

Through its programs and outreach, the Exo Technologies Center of Excellence is not only developing standards to assure users that exo skeletons are safe, reliable and effective, but to build the capabilities and resources for these technologies to enhance and improve many more lives.

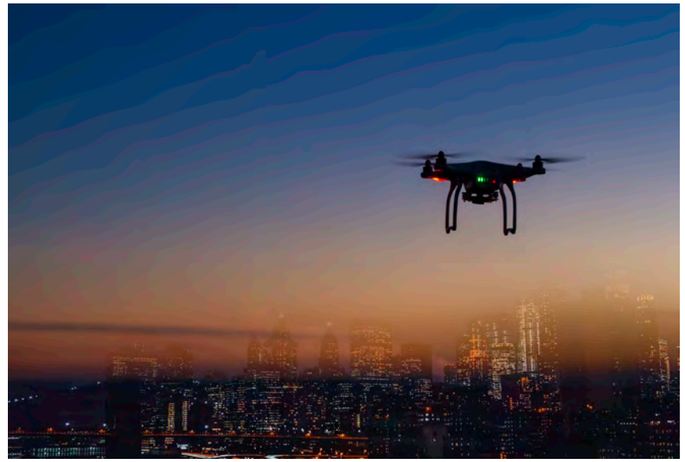
EMERGING AIRSPACE

Emerging technologies are revolutionizing air travel and transport. But fast-paced change is also creating challenges for regulators. With drones and unmanned aircraft taking off in larger numbers, new approaches are needed to ensure the safety of busier skies. And as innovative electric aircraft bring the prospect of more affordable and sustainable urban air travel, safety standards and testing must step with changing technology.

AUTONOMOUS AIR TAXI CONCEPTS

SPACE AIR TRAVEL TESTING

ADVANCED DRONE TECHNOLOGY



ASTM International is leading strategic efforts to ensure that new aviation services are ready for take-off. ASTM committees are developing standards and training across the sector, from electronic license plates for drones to performance-based standards for electric propulsion and automated flight control systems. They are also building links between different parts of the ecosystem, bringing together regulators, R&D, and industry leaders working on unmanned aircraft systems, urban air mobility, and autonomous flight and by leveraging its expertise in emerging technologies. ASTM is getting ahead of the game to create the operational, infrastructure, and standards framework to ensure safety and success for a new era of air travel.

ROBOTICS AND AUTOMATION

The ambition for ASTM Xcellerate™ is to continually explore the needs of new technologies and the role standards can play in their development. In the field of robotics, automation, and autonomous systems, ASTM Committee F45 has recently expanded its remit to go beyond autonomous unmanned ground vehicles (A-UGVs). New topics include robot performance and mobile manipulators (robot arms onboard autonomous vehicles).

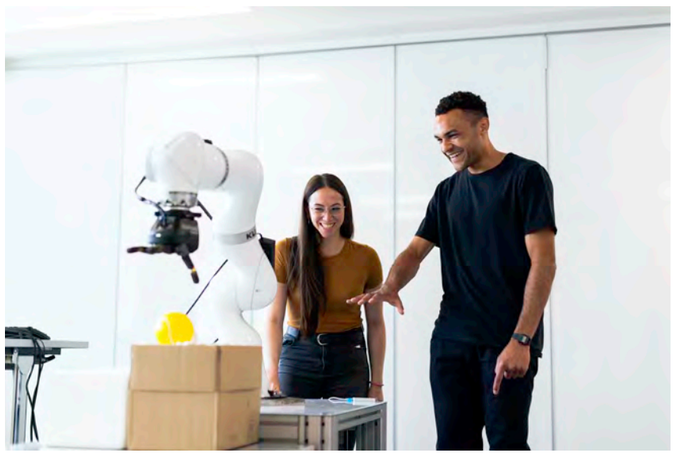
AUTONOMOUS VEHICLE

ROBOTIC ARM CONCEPT DESIGNS

As scope continues to expand ASTM Xcellerate's leadership team will examine how best to increase impact further, potentially following similar paths to those established for additive manufacturing and exo technologies.

One exciting area to explore is the overlap between technologies. As an example, exoskeletons may utilize robotic components and semi-autonomous systems. On this basis, the members of F45 will be developing standards that help the safety and reliability of exo technologies.

This kind of agile, cross-technology development lies at the heart of ASTM Xcellerate™, proving a flexible platform for ideas to be shared and new solutions to be found, without narrow constraints or siloed mindsets. The possibilities are exciting and are rapidly evolving every day.



ROBOTICS DESIGN DEVELOPMENT

XCELLERATE ™

If you would like to discuss any aspect of ASTM Xcellerate's work, current or future, please contact xcellerate@astm.org

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LET'S XCELLERATE

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