



Number of countries impacted by live grants

100+

# Global impact.

**Who we are**

**The Lloyd's Register Foundation (the Foundation) is an independent global charity with a unique structure and an important mission: engineering a safer world.**

We reduce risk and enhance the safety of the critical infrastructure that modern society relies upon in areas such as energy, transport and food. We do this by supporting high quality research, accelerating technology to application and through education and public outreach.

Our unique structure comes from the fact that we own a significant trading company, Lloyd's Register (LR). We share the same mission and work together to make the world a safer place.



Total value of grants given



£122.4m

Supporting excellent scientific research

£63.9m

Accelerating the application of research

£29.8m

Promoting safety and public understanding of risk

£13.6m

Promoting advancement of skills and education

£14.9m

New grants awarded this year



38

Total number of approaches for funding received



116



# Independence, partnership and purpose.

Our grant portfolio now exceeds £120 million, delivering real impact to society through research, education, and the acceleration of emerging technologies.



**Thomas Thune Andersen**  
Chairman

This year marks the culmination of the Foundation's first five years as an independent global charity and I am immensely proud of what we have achieved in such a short time.

We must build on this, and ask how the Foundation can become a global leader and bring together organisations who share our mission. Working alongside LR we enhance safety and advance public education in society within the transportation industries and other engineering and technological disciplines.

To do this, the Foundation has developed an ambitious new strategy that will enable us to have greater impact than ever before. We plan to focus our efforts on the most pressing safety challenges such as safety at sea, food safety, and improving society's understanding of risk. As a member of Friends of Ocean Action, I'm excited by our commitment to ocean safety and sustainability, and we will be working with partners to bring about real change in this area.

Partnerships and collaboration are central to achieving our social mission. Global challenges need global solutions and cannot be tackled by working alone. Going forward, the Foundation will develop its communications, tirelessly promoting the issues, and seeking out willing collaborators who share our deepest values and strong social purpose.

Diversity is also critical to delivering our strategy and mission. The Trustees continue to promote diversity and inclusion, recognising that the experiences and expertise that come from a diverse workforce can only benefit our organisation. Celebrating our differences is an important part of our culture.

I would like to thank my fellow Trustees for their support, enthusiasm and commitment to strong governance throughout the year. I take great pleasure in welcoming Ishbel Macpherson whose expertise and wisdom will help guide the Foundation as it embarks on this new strategy.

Finally, on behalf of the Trustees, my warmest thanks go to the Foundation's Chief Executive Richard Clegg and the Foundation staff who have achieved so much in just five years.

A handwritten signature in black ink, appearing to read 'T. Thune Andersen'.

**Thomas Thune Andersen**  
Chairman, Lloyd's Register Foundation



Partnerships and collaboration are central to achieving our social mission. Global challenges need global solutions and cannot be tackled by working alone.



This year marks a milestone for the Foundation. It's witnessed the culmination of the first five years of our strategy since we came into being as an independent global charity possessing a unique governance structure in 2012. In that short history I'm immensely proud of what we've achieved.

# New frontiers.



**Professor Richard Clegg**  
Chief Executive



The past year has been full of new frontiers, bringing together some of the best minds in the world to understand emerging technologies and trends.

From the beginning we've had in place a clear strategy of what we want to achieve. We also have the guiding principle that grant giving, however well intentioned, can fall short if based on assumptions that are wrong, or if operational delivery lets them down. That's why we've paid equal attention to our internal processes as well as external grant giving.

Such efficiency, alongside talking to and learning from other similar charities, has helped us keep our overhead and governance costs comparatively low when benchmarked against others in the sector. Not only does that help in increasing the amount of resources available for charitable activity, it also contributes towards maximising our impact on society. A double benefit.

In 2019 the Foundation awarded new grant commitments of £7.7 million, down on the previous year's figure of £23.9 million. However, our direct charitable expenditure (the philanthropic activities the Foundation engages in directly, rather than by making grants to grantees) is steadily increasing. One example of this is the significant investment we're making in widening access to our maritime heritage collection of 1.25 million documents, by cataloguing, digitising and making them freely available on the web as a unique historical and educational resource. So far this year we've digitised around 200,000 such records.

Annual grant commitments is one metric by which to measure the Foundation. We're also in a fortunate position due to our unique governance structure and endowment that we can afford to take the long view. Consequently, some of our significant grants can be worth over £10 million extending over 5-10 years. Our grants portfolio currently exceeds £120 million and is increasing. Working with our grants community on managing this portfolio and driving it towards impact, is a growing body of work and something we take seriously.

Fundamentally it is mission focused outcomes and impact that drive us. We have a clear impact framework in operation and are careful to see that all our grants have a plausible pathway to application from the outset. We believe that the best way to demonstrate impact is through case studies – real world, practical examples of where we have demonstrably added value. In 2019 we published our first set of impact stories on postcards and are looking to add to them as well as translate them into other languages and formats such as short videos. The wish of the Foundation is to be known for who we are and what we stand for, and the impact we're making in the world. Telling our story helps bring the Foundation to life and further helps in attracting partners who share our deep values and purpose.

The past year has been full of new frontiers. The Foresight Reports and Insight Reports we publish serve as a mechanism for bringing together some of the best minds in the world to understand emerging technologies and trends. Not only do they serve as due diligence for our own grant decision making, they're also invaluable for others to build on. In 2019 we initiated foresight related work on subjects including future engineering uses of the sea, the future of regulation, and food safety. We look forward in the year ahead translating these into programmes of work.

I stated in my first paragraph that this has been a milestone year for the Foundation with the culmination of its first five year strategy. In March this year the Board of Trustees endorsed the next step in the journey with our refreshed strategy to 2025. We will be heightening our focus on becoming challenge-led and evidence-driven. Next year we're looking forward to launching these challenges and also building in-house our new Evidence and Insight Centre.

The success of the Foundation belongs to everybody involved including our grants community and colleagues in LR who work hard to support us. We're also indebted to our Advisory Council members who challenge our thinking and present us with fresh opportunities and ideas. I particularly want to thank our Trustees who give their time and much more pro bono.

**Professor Richard Clegg FEng, FRSC**  
Chief Executive, Lloyd's Register Foundation

# Our five year strategy: 2015-2019.





## Our mission

To secure for the benefit of the community high technical standards of design, manufacture, construction, maintenance, operation and performance for the purpose of enhancing the safety of life and property at sea, on land and in the air.


The advancement of public education including within the transportation industries and any other engineering and technological disciplines.

## Our vision

To be known worldwide as a leading supporter of engineering-related research, training and education that makes a real difference in improving the safety of the critical infrastructure on which modern society relies. In support of this, we promote scientific excellence and act as a catalyst working with others to achieve maximum impact.

				
<b>Strategic themes</b>	<b>Supporting excellent scientific research</b> <a href="#">See page 10 for more detail</a>	<b>Accelerating the application of research</b> <a href="#">See page 14 for more detail</a>	<b>Promoting safety and public understanding of risk</b> <a href="#">See page 18 for more detail</a>	<b>Promoting advancement of skills and education</b> <a href="#">See page 22 for more detail</a>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>Striving for excellence and impact</li> <li>Promoting technology foresight</li> <li>Building world-class research teams</li> </ul>	<ul style="list-style-type: none"> <li>Accelerating technology uptake</li> <li>Informing standards and policy</li> <li>Facilitating the mobility of researchers</li> </ul>	<ul style="list-style-type: none"> <li>Promoting the safety of life, property and the environment</li> <li>Enhancing public understanding of risk</li> <li>Maintaining and promoting a memory bank of safety and risk management developments</li> </ul>	<ul style="list-style-type: none"> <li>Inspiring the next generation</li> <li>Enhancing the knowledge and skills of the workforce</li> <li>Widening access to disadvantaged and under-represented communities</li> </ul>
<b>Funding priorities</b>	<ul style="list-style-type: none"> <li>Structural integrity and systems performance</li> <li>Resilience engineering</li> <li>Human and social factors</li> <li>Emergent technologies</li> </ul>		<ul style="list-style-type: none"> <li>Supporting safety organisations</li> <li>Communication and public debate of scientific research</li> <li>Developing the Foundation's Heritage and Education Centre library and archive</li> </ul>	<ul style="list-style-type: none"> <li>Pre-university education</li> <li>University education</li> <li>Vocational training and professional development</li> </ul>

## Sectors we serve

 Aerospace	 Automotive	 Built environment
 Food	 IT and communications	 Manufacturing
 Healthcare and medical	 Oil and gas upstream	 Power and utilities
 Marine	 Oil and gas downstream	 Rail and metro



# Supporting excellent scientific research.



This year, we have published foresight reviews on the future of ocean engineering and food safety. We have also initiated new insight-led activity on the safety of fishing and ferry industries.

## Promoting scientific foresight

The foresight reviews published over the last year are the result of engaging with global networks that provided diverse views around core themes. The findings provide society with a view of the future and allow the Foundation to identify where it can have the greatest impact in pursuit of its charitable goals.

### Future of Ocean Engineering Foresight Review

Workshops were held in Singapore, Southampton, UK and St John's, Canada engaging a wide range of experts to consider the future of ocean engineering. The review sets out a wide number of challenges and recommendations that will be published and used to inform the direction of our future programmes in 2020.

### Future of Food Safety Foresight Review

The Foundation held events in Paris, France and San Diego, USA to discuss the future of food safety. The insights gathered so far were shared with the UN's Food and Agriculture Organisation (FAO) in Rome, Italy, where discussions centered on the development of technologies delivering blockchains, microbiomes and offshore sea farms. The review was launched at the FAO in September 2019.

### Safety in fishing industry

Our insight report on the safety of fishing published in June 2018 identified three countries that had the highest fatality rates for fishers; one of these was the Philippines. In order to address these issues, a key recommendation from the report was to understand the unique challenges in specific countries and co-develop safety solutions with local stakeholders. In response to this the Foundation supported the Fisheries and Marine Institute of the Memorial University of Newfoundland and the FISH Safety Foundation with a grant of £149,675 to collect baseline data on the current situation in the Philippines using consultations and analysis of stakeholder data to develop specific recommendations that address the challenges. The grant also aims to build a coalition of supporters who will pilot the recommended interventions and support and sustain these initiatives into the long term.

### Safety in ferry industry

Our insight report published in June 2018 used historical statistics to also identify the Philippines as having one of the highest numbers of ferry fatalities; however, recent statistics indicate a rapid improvement with no lives lost in 2018. The Foundation funded a study due to report in October 2019 (value £41,400), conducted by the industry association Interferry, with the aim of understanding the safety enhancements that worked and sharing lessons learned in other geographies.

### National Structural Integrity Research Centre (NSIRC) – Five years in

We are halfway through our first major grant which has so far funded an equivalent of more than 48 years of PhD research in structural integrity. Of this sum, 45% of researchers are female which compares favourably against a UK average of less than 10% of female engineers working in industry.

Two notable student successes in the last year have been Madie Allen and Cui Er Seow. Madie won an open international competition by the US National Institute of Standards and Technology (NIST) for modelling residual stresses in an additively manufactured part. Cui was awarded best presenting author at the American Society of Mechanical Engineers (ASME) conference on how her work on properties of additive manufactured parts is providing insights into new testing and manufacturing standards.

A significant number of these projects will underpin the standards, test methods and assurance tools used by society into the future.



### Opening access to research infrastructure

Globally, there are many excellent researchers who are unable to maximise the outputs of their work because they lack access to international research infrastructure. In the last year the Foundation launched international calls with the aim of assisting researchers to gain access to resources that they would otherwise find inaccessible. The trial was, however, unsuccessful with very few applications received from target communities. We believe that our inability to reach target communities in developing economies prevented this initiative from achieving its aims. We are taking the lessons learned and strengthening our strategic communications and stakeholder engagement to understand how to reach future target audiences better.

### Energy Storage Foresight Review

Our plans to initiate activity taking forward the recommendations from our Energy Storage Foresight Review did not become a reality in 2018. It proved more difficult than we anticipated to engage with the community to identify an intervention where the Foundation could make a distinctive difference. However, we anticipate using the findings in developing our challenge-led programmes within our new strategy in areas such as safety and sustainability.

### Solid bulk cargo liquefaction: Strategies for effective control

Solid bulk cargo liquefaction in ships has been responsible for the loss of more than 100 seafarers' lives and nine bulk carriers in the last decade. This corresponds to 10% of recorded bulk carrier losses and 50% of fatalities, indicating the seriousness of vessel loss due to cargo liquefaction. An invitation to Southampton University to submit a proposal has galvanised the industry into an unprecedented collaboration. A plan of research, education, communication and new operational protocols has been co-developed with insurers, ship owners, mining companies, a regulator, a classification society, trade associations, lawyers, technology and engineering consultants, unions and charitable organisations that protect seafarers' safety. These improvements will lead to better awareness and operational controls to address the problem and save the loss of life and property.

### Effective crew strategies

The Foundation supported research at Southampton Solent University to investigate the safety implications of different patterns of working for maritime crews. This was showcased at the International Maritime Organisation's Cross-Industry Conference on 31st January 2019. The work is available for others to build on and we will continue to observe for evidence of its application and impact.

### Open-access journal in data-centric engineering

Working in partnership with Cambridge University Press and the Alan Turing Institute, we supported the creation of a new data-centric engineering journal which publishes high-quality research that exploits data to inform the development of engineering systems and products in order to reduce risk, and to improve reliability, resilience, safety, efficiency and usability. Papers will be authored by and for researchers beyond the usual academic communities to enable maximum impact. The Foundation's grant supports the open access aspects of the journal allowing this to be freely accessed by users who would otherwise not be able to afford access to high quality peer reviewed knowledge. They were awarded £250,000 over five years.

### Seoul National University

The Foundation awarded a grant to Seoul National University, building on previous work. They will be developing innovative technologies in ship design with a particular focus on ship performance in waves and applications of new hull-form design. They were awarded £600,000 over three years.



### Future plans

#### In 2020 we plan to:

- Consult on and publish foresight reviews on cyber security, space technologies, human factors and the future of regulation.
- Initiate activity in response to our new challenge-led strategy.
- Increase collaboration amongst our grant holders.

As part of producing our plans in these areas we will be developing metrics to gauge their impact and benefit to society.

### CASE STUDY

## Data-centric engineering programme – Alan Turing Institute (ATI).

In 2015 we awarded a five year grant of £10 million to the Alan Turing Institute (ATI) to grow a new capability we named Data Centric Engineering (DCE). Its aim is to address the safety challenges that step changes in data-driven technology and artificial intelligence will create in engineering and industry. The programme aims to bring together world-leading academic institutions and major industrial partners from across the engineering sector to build collaborations and maximise impact.

2018/19 has seen a period of intense growth for the DCE programme. Over the last 12 months the programme grew from 30 programme researchers to more than 80, from 20 active projects to over 40, and brought in £13 million of new funding leveraged from the investment made by the Foundation. The 3D printed Bridge project continues to impress with the overall project and ATI-led components being recognised through the award of a number of prestigious high profile international prizes. Likewise, the development of formal strategic partnerships with the London Mayor's Office, Shell, National Air Traffic Service, Rolls-Royce and many others are leading to a higher profile in the UK national and international press as well as on social media.

New Group Leaders were appointed from Rolls-Royce, Cambridge, UCL, and Queen Mary's University. The DCE international footprint is also developing apace with strategic partnerships in Australia building on the Foundation's Trading Group work on the Shell Prelude FLNG facility. Canada, with its massive scale federal and provincial government investment in artificial intelligence is another geography where DCE is establishing strategic partnership.

As the programme has grown it has also formalised its processes and procedures, setting in place an impact framework, a reporting structure for programme leads, a new website and public seminar series, and a coordinated pipeline of new industry partners. As we move into the fourth official programme year, it is now looking at how to maximise impact, through an innovation and commercialisation plan, an international engagement strategy, and through significant new industry partnerships. The programme will also be preparing for a major international conference and the launch of a new DCE journal with Cambridge University Press to solidify this field as a vital new area of academic and industry interest.





# Accelerating the application of research.

Last year we outlined plans for major new programmes including the safety of complex systems, end of life decommissioning of high-hazard engineering assets and the Lloyd's Register Safety Accelerator Programme.



## Highlights from our charitable activities and new grants

### Partnerships with the Royal Academy of Engineering (RAEng)

Three new programmes totalling £15 million awarded in 2018 to the RAEng are now well underway with initial development and delivery. The 'Safer Complex Industrial and Engineered Systems' programme has appointed Dame Judith Hackett as chair of its programme board. The 'Enhanced Safety in Decommissioning and End of Engineering Life' programme board met for the first time in late November and agreed a focus for the first year on major infrastructure decommissioning in the oil and gas and marine sectors. The programme will also commission an evidence base identifying the major global hotspots for waste across multiple sectors. Professor William Powrie (Southampton University) is chairing the board. The 'Developing Skills' programme was announced at the RAEng annual conference for its international engineering education programmes and stakeholders on 24th September 2018, with the RAEng issuing a call for expressions of interest during the conference. Professor Peter Goodhew has agreed to chair the programme board and will contribute with his expertise in engineering education. Calls for proposals were announced in early 2019 with a closing date of July 2019. The responses are currently being reviewed.

### Maritime Blockchain Labs

Maritime Blockchain Labs (MBL), a BLOC (Blockchain Labs for Open Collaboration) initiative in which the Foundation is a founding partner, was announced as a member of Massachusetts Institute of Technology (MIT) newest Solve class. Solve is a MIT initiative that advances lasting solutions from tech entrepreneurs to address the world's most pressing problems. MBL was selected for its work on developing shipping emissions monitoring, reporting and verification solutions, which build upon the blockchain-based Marine Fuel Assurance prototype developed through the Foundation's grant funding. Our grant to MBL of £490,000 was awarded in April 2018.

### Assuring Autonomy International Programme (AAIP)

In 2017 we awarded a £10 million grant to York University in the field of assuring autonomy. In its first 18 months the AAIP programme has rapidly established itself. It has focused on five key areas: demonstrator projects; foundational research; international community building; education and training; and public engagement. With nine international demonstrators underway, research on dynamic risk assessment, an international community that includes visiting industrial fellows that share real world problems and solutions, user-inspired training for senior leader through to systems engineers, and public outreach through articles in *The Conversation and New Statesman*, the programme is leading in an area that has previously been under-recognised.

The AAIP programme's influence is also growing. Programme Director, Prof John McDermid, chairs the BSI's Centre for Autonomous Vehicles Advisory Board and has presented to the All-Party Parliamentary Group on Artificial Intelligence (AI). Programme manager Anna MacIntosh has been an invited panellist in Washington DC on AI policy with the UK Office for AI. The programme's relevance and importance has been acknowledged through the awarding of £10 million from the UK Research Partnership Investment Fund (UKRPIF) enabling an expansion of the programme's capability and capacity.

### Sharing engineering data for the public good

In November 2018 the Foundation awarded a grant of £99,337 with the Open Data Institute (ODI) to investigate ways of sharing engineering data in industry and business for the public good. Prof Richard Clegg and Prof Sir Nigel Shadbolt (Lead author of our Big Data Foresight Review) shared the stage at the Open Data Institute summit in November 2018 to announce a new initiative using shared and open data to improve safety in our built infrastructure and across society. ODI and Lloyd's Register Foundation will collaborate together with a range of engineering and safety organisations across the UK, to identify how increasing access to data can help inform engineering design, monitor safety, and improve operations of key infrastructure.

### Fullagar Technologies Ltd

A proportion of our funding for the National Structural Integrity Research Centre (NSIRC) programme awarded to The Welding Institute (TWI) in 2014 has been set aside for the accelerating research to application; in this case the commercialisation of safety enabling technology is happening through a joint venture between TWI and Lloyd's Register Business Assurance and Inspection Services. With seed funding from the Foundation, Fullagar Technologies is initially developing three products: one that can identify a serious form of cracking in pipelines; one that can cheaply monitor thickness reduction due to corrosion; and one that can prove the ongoing quality of electron beams used for joining and additive manufacture of critical components.

### Next generation prediction methodologies and tools for system safety analysis

This story started when the Lloyd's Register Educational Trust awarded funding to Nottingham University to build a team researching methods for assessing dynamic (changing) risk in the rail industry. We took over that commitment when the Foundation was created in 2012 and since then have been working with Nottingham University on its direction and application. Ten years later, with Foundation support, the team has leveraged more than £6 million of additional funding from other sources and grown to 43 team members having a leading global reputation in dynamic risk assessment. The methodologies created have been openly disseminated but the Foundation is now supporting the development of the programme to include the nuclear, aerospace and other sectors. To maximise impact, Nottingham's methodology will be embedded in commercially available LR Group software called RiskSpectrum and made available to other interested parties.



### HiLo

HiLo is a new not-for-profit organisation which works across the shipping industry to gain predictive insights through sharing operational data in a trusted way. Actions taken as a result of data sharing through HiLo has resulted in a 72% reduction in risk from lifeboat accidents, the risk of engine room fire reduced by 65%, and the risk of bunker spills by 25%. In total we have awarded £980,000 in grants to HiLo in two equal phases to establish their operating model. The final phase of £490,000 was awarded in July 2018.

### Global Manufacturing & Industrialisation Summit (GMIS)

Globally, the development and introduction of the fourth Industrial Revolution (4IR) is accelerating. 4IR combines manufacturing and digitisation to provide multiple manufacturing benefits. Safety of those using the systems, of the systems themselves and the products have not received the focus necessary to understand or minimise risks. Working through the Global Manufacturing & Industrialisation Summit network, chaired by the UAE Ministry of Energy & Industry and the United Nations Industrial Development Organization (UNIDO), the Foundation is supporting the elevation of safety aspects to the attention of global leaders, directors of international companies and academics through the award of a grant of £249,650 to GMIS in December 2018.

### Discovering Safety's first pilot study reports back

In 2017 the Foundation awarded a £10 million grant to UK Health and Safety Executive (HSE) to create the Discovering Safety programme. It's aim is to explore and unlock the value within the UK Health & Safety Executive's accident and incident data repository. The first pilot study completed during the year was on the topic of industrial 'loss of containment'. The results provide confidence that the data does contain valuable insight, but also shows how there may be better ways of collecting data that could unlock greater insight in the future.

### SafetyTech

Digital technologies have enabled some sectors to advance rapidly, with FinTech and HealthTech industries as two high profile examples. There is no digital community that specifically focuses on safety and we believe that the creation of a SafetyTech community could significantly reduce the accidents that occur today. The Lloyd's Register Safety Accelerator is an important step in the creation of this community, but to successfully bring people into this space it is important to indicate the size of the market and multiple ways to engage and be recognised. We have been undertaking activity to understand better what is involved to create a SafetyTech community and what role we could play in making this happen. We will be taking this forward in our new Foundation strategy as a way of bringing multiple stakeholders together to grow investment in the safety-related market.



### Future plans

In 2020 we will:

- Initiate activity towards establishing a SafetyTech community utilising the Foundation's unique position as a thought leader and funder in this space.
- Our new challenge-led strategy that we are launching next year will continue to look for opportunities to accelerate the uptake and application of technology and good ideas.

### Resilience Shift

In 2016 we awarded a £10 million grant to Arup to establish the Resilience Shift (RS) programme. In 2018 four new grantees were appointed by RS to develop industry specific resilience primers. RS has worked on resilient water governance and developed and published a prototype of a digital tool, named WaterShare. Developed in partnership with the City Water Resilience Framework, Stockholm International Water Institute (SIWI) and Organisation for Economic Co-operation and Development (OECD) the tool specifically tackles the need for collaboration, for sharing information across departments, between levels of government and between critical sectors. After a global search Dr Angela Wilkinson was announced as the new director for the RS.

### Polar shipping

In 2017 we awarded a £680,000 grant over four years to Aalto University in Finland to develop guidance notes on scenario-based risk management for polar shipping. It builds on previous Foundation funded research in Arctic operations to significantly update recommended practice. It enables the International Maritime Organisation (IMO), government agencies, class societies and industry to establish and maintain the highest standards of safety for shipping operations in the Polar areas.

### CASE STUDY

#### Lloyd's Register Safety Accelerator.

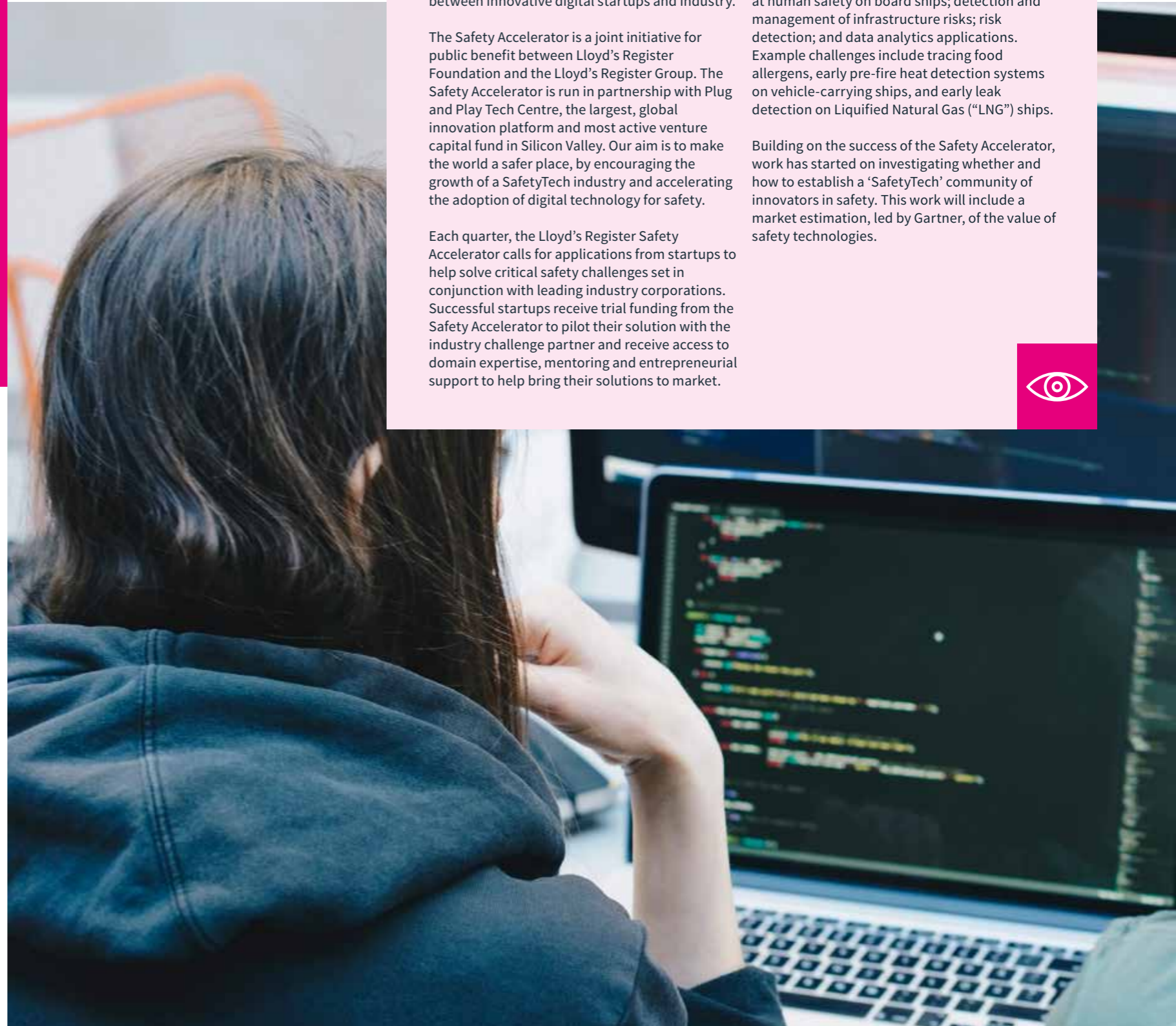
The Lloyd's Register Safety Accelerator is a challenge-based accelerator programme, creating, facilitating and guiding collaboration between innovative digital startups and industry.

The Safety Accelerator is a joint initiative for public benefit between Lloyd's Register Foundation and the Lloyd's Register Group. The Safety Accelerator is run in partnership with Plug and Play Tech Centre, the largest, global innovation platform and most active venture capital fund in Silicon Valley. Our aim is to make the world a safer place, by encouraging the growth of a SafetyTech industry and accelerating the adoption of digital technology for safety.

Each quarter, the Lloyd's Register Safety Accelerator calls for applications from startups to help solve critical safety challenges set in conjunction with leading industry corporations. Successful startups receive trial funding from the Safety Accelerator to pilot their solution with the industry challenge partner and receive access to domain expertise, mentoring and entrepreneurial support to help bring their solutions to market.

In its first year the Safety Accelerator has completed four rounds supporting innovators by bringing together industry problem owners with startups possessing solutions. These are: looking at human safety on board ships; detection and management of infrastructure risks; risk detection; and data analytics applications. Example challenges include tracing food allergens, early pre-fire heat detection systems on vehicle-carrying ships, and early leak detection on Liquefied Natural Gas ("LNG") ships.

Building on the success of the Safety Accelerator, work has started on investigating whether and how to establish a 'SafetyTech' community of innovators in safety. This work will include a market estimation, led by Gartner, of the value of safety technologies.







# Promoting safety and public understanding of risk.

We reviewed and updated our global safety challenges plans; acted on the recommendations of our Global Safety Evidence Foresight Review; and fostered innovation in safety data sourcing and analysis.



## Highlights from our charitable activities and new grants

### World Risk Poll

Working with Gallup, we have commissioned the world's first poll on people's attitudes and experiences concerning safety in their everyday lives. The 'World Risk Poll' is the world's largest study into how people around the world think and feel about risk and safety, including at work. It surveys over 140,000 people from more than 140 countries to improve our understanding of risk and make the world a safer place. It will produce the first ever globally comparable, publicly available data set on the public understanding of risk. The poll will be undertaken four times over the next eight years with the first results being published in July 2020.

### Public understanding of risk in Asia

We are delighted that Professor Koh Chan Ghee has been appointed to lead the multi-disciplinary team at the Institute, based at the National University of Singapore, which officially launched in June 2019. The Institute aims to change the way we question, examine and understand risk issues and will help us to improve lives by transforming the risk communication landscape and improve the public understanding of risk.

### Sharing engineering data for the public good

Through the Open Data Institute (ODI) we are engaging with the business and industry community to identify, from a safety perspective, the benefits of sharing engineering data. By sharing data, we mean increasing access to data in ways that protect privacy, retain trust and respect commercial confidentiality. ODI's work will also explore models for data sharing (such as Data Trusts) and which of these have the greatest chance of success within industry sectors.

### Reaching around the world

In August 2015 we awarded a four year grant to The Conversation of £180,000 to provide support for a science editor. The outcome has led to 709 articles that were read by a global audience of more than 35.5 million readers. Our funding also allowed the paid employment of three interns, one of whom has now been taken on as a full-time member of staff.

### Seafarers International Research Centre

In July 2018 we awarded a two year grant of £250,000 to the Seafarers International Research Centre (SIRC) in Cardiff. This has led to the production of a video and accompanying guidance to improve communications and interactions between ship-based and shore-based personnel, which is already being used by 28 shipping companies.

### Safety culture at sea

In October 2018 we extended our support of the Aviation and Maritime Confidential Incident Reporting (CHIRP) maritime programme with a grant of £150,000 over three years. It is growing in reputation and influence through its provision of a free, confidential service to report near misses and hazardous occurrences at sea. Lessons learnt are shared with a minimum of 250,000 seafarers every three months.



The 'World Risk Poll' is the world's largest study into how people around the world think and feel about risk and safety, including at work. It surveys over 140,000 people from more than 140 countries to improve our understanding of risk and make the world a safer place.



### Saving lives at sea

Our continued support for the RNLI's (Royal National Lifeboat Institution) training of their volunteer crews teaches the vital skills they need to rescue those in danger, whilst keeping themselves and their fellow crew members safe. In 2018, 250 crew members from 120 lifeboat stations around the coasts of the UK and Ireland completed their training. Crew members from these stations launched a total of 5,167 times in 2018, aiding 5,427 people. During these launches, 113 lives were saved. In 2016 we awarded a five year grant to RNLI of £1,059,000.

### Risk communication

We know that the rapid pace of scientific and technological development outstrips the ability of the public and policy-makers to engage with it meaningfully. We are working with the Royal Institution in the UK to see if we can establish a global multidisciplinary network that will inform and strengthen the most appropriate routes for international public engagement on new technologies and scientifically-based approaches for improving safety and quality of life. Initially this involves mapping likely stakeholders and having initial conversations with those that share our purpose.

### The China Academy for Safety Science and Technology (CASST)

CASST has developed standards for emergency preparedness for industrial incidents, co-funded by the Foundation and including LR as part of the delivery team. The project has been endorsed at the highest levels in China and training in the use of the protocols is being rolled out to partner countries involved with the One Belt, One Road initiative, including Vietnam, Cambodia and Laos. The One Belt, One Road initiative is a global development strategy adopted by the Chinese government involving infrastructure development and investments in 152 countries and international organisations in Asia, Europe, Africa, the Middle East, and the Americas. To support our collaborations in China the Foundation is translating its foresight reviews into Chinese, starting with the Resilience Engineering and Public Understanding of Risk Foresight Reviews.



### Future plans

In 2020 we plan to:

- Initiate activity in response to our new challenge-led strategy. We anticipate programmes will include the following:
  - Better understanding the risks associated with emerging technologies, including complex, systemic risks.
  - Planning our response to the first World Risk Poll.
  - Public understanding of risk in Asia, where there is very little expertise in risks and the science of risk perception.
  - A curated network of technology and communication experts to improve the communication of risk.
- Establishing our Evidence and Insight Centre to understand current and future uses of safety data and evidence, and the challenges of the current evidence landscape; and to design interventions around actual safety performance, exploiting opportunities provided by new technologies, data collection methods and analytical techniques.
- Strengthen our portfolio for improving the public understanding of risk. This will include support for the annual Huxley Summit, which will host 250 key leaders for a dialogue about the actual and perceived risks in emerging technologies that will support society's critical infrastructure.

### CASE STUDY

### World Risk Poll.

In September 2018 we awarded a six month grant to Gallup for £249,000 to design and trial a survey questionnaire on global public attitudes to risk and safety, and test it in eight different countries. The aim is to explore how people around the world understand risk, and how those perceptions affect their decision making process on matters relating to their safety and well-being. The questionnaire development and testing was successful and the Foundation has now decided to implement the research globally, with the resulting dataset (140,000 people over 140 countries) being provided as a global public good to support researchers, policy makers and other interested stakeholders make better informed data-driven policies and interventions.

For the next phase of the work with Gallup, the Foundation has entered into a contract valued at £14 million to repeat the World Risk Poll four times over eight years and interpret and publish the results. The resultant global dataset will provide unique insights into public attitudes and understanding of risk in everyday lives, which we will be making openly and freely available.

Working with the team at Gallup, we are creating a communications plan for 2019-20 to launch the World Risk Poll engaging the public, researchers, and other stakeholders. The first event was a London-based launch of the project in June 2019 based on the publication of the first two outputs: the questionnaire survey report and the compendium of risk data. The publication of the first iteration of the World Risk Poll is planned in October 2020.





# Promoting advancement of skills and education.

We launched our heritage collection as a unique historical and educational resource; initiated a new partnership with the Royal Academy of Engineering; and inspired more young people towards engineering.



In 2018/19 we fulfilled our intention to produce an investment appraisal for the Lloyd's Register Foundation Heritage and Education Centre (HEC), focusing on a new vision and ways in which the unique Lloyd's Register historical collection and archive can help us address our mission. In addition, we have directed a new Makerspace-based approach to understand how we can inspire more young people towards engineering. We worked with the UCL Centre for Engineering Education to publish *Innovations in Engineering Education; Inspiring and Preparing Our Engineers for the 21st Century*, which we launched in February 2019. Finally, we also initiated work with the RAEng to review world data on the provision of engineering skills and education to identify any significant gaps linked to the Foundations safety mission.

## Highlights from our charitable activities and new grants

### Enthusiasm for Engineering

We are funding 20 ENTHUSE partnerships across the UK, to stimulate and sustain young people's interest and enthusiasm for engineering through a £300,000 grant over two years awarded in November 2018. Led by STEM Learning, the funding enables groups of four to eight schools and colleges to work together in partnerships to identify and address issues with participation and achievement in engineering and technology. We aim to create a community of teachers with cutting-edge technical and pedagogical understanding in engineering and emerging technologies who are well connected to local employers within the engineering sector, who are able to deliver a quality engineering education programme. Teachers and schools are being provided with expert in-school guidance, mentoring, and continuous professional development based upon our emerging technology areas and other forms of support. To date, the partnerships have already recruited 85 schools and colleges across the UK and engaged nearly 100 employers, including Arup, the Ministry of Defence and Siemens.

### Reimagining Engineering Education

In February 2019, the Foundation helped to launch *Innovations in Engineering Education*, a report led by the Centre for Engineering Education at UCL, that considers 21st century engineering, how it can be taught and how we can encourage more people to study it. The aim is for the insights in the paper to be adopted and used in engineering education to attract a more diverse generation towards science, technology, engineering and mathematics (STEM) subjects. The value of the grant given to UCL's Centre for Engineering Education was £55,000.

### Makerspaces

To achieve the Foundation's mission, we recognise the importance of increasing the numbers and diversity of those within engineering professions. Makerspaces, sometimes also referred to as hackerspaces, hackspaces, and fablabs are creative, DIY spaces where people can gather to create, invent, and learn. We recognise a unique opportunity for maximising the potential of Makerspaces as a vehicle for widening participation in engineering and are funding two new programmes in this area. One will be led by Professor Louise Archer (Institute of Education, UCL) through a three year grant of £688,000 awarded in June 2019, and the other will be with the Educational Volunteers Foundation of Turkey (TEGV) through a three year grant of £201,000 awarded in May 2019. The programmes will

be mutually beneficial and will produce valuable evidence of the teaching and engagement approaches that work in Makerspace settings.

### Improving Safety Culture

We are delighted to be supporting the Hellenic Marine Protection Agency (HELMEPA) in a new project that aims to strengthen maritime safety culture among seafarers, shipping companies and other marine communities of Greece and Cyprus through the establishment of a voluntary reporting scheme for near misses by all types of vessels, a series of refresher training seminars and simulation on incident analysis, 'safety-at-sea' workshops and a wide safety awareness campaign. In June 2019 we awarded a two year grant of £288,000 to HELMEPA in support of this work.

### Data Skills for 21st Century Engineering

We are building on the success of our data-centric engineering programme at the Alan Turing Institute (ATI) and working with Imperial College and ATI on a programme that aims to train the next-generation of engineers, leaders, and influencers with the data skills to transform safety, reliability, and efficiency of critical infrastructure.

### Saving Lives in South East Asia

The South East Asia Skills Enhancement Programme (SEASEP, formerly SEATP) is a skills initiative that aims to drive down the rate of fatal occupational accidents in SE Asia and contribute in saving more than 100,000 lives per year. Since launching in October 2018, through a three year grant of £2 million with TWI, the programme has already recruited 300 students across seven locations in Indonesia, and ten Memoranda of Understanding have been signed with industry, training providers and other agents. The Indian phase of the programme started in April 2019.



### Tall Ships Youth Trust

We recognise the life-changing experience that Tall Ships Youth Trust voyages can bring to so many young people. That is why we are very proud of our support for their 'STEM and the Sea' programme through a £126,000 grant over 3 years awarded in September 2018. Our funding will allow 90 disadvantaged young people to go on voyages that will offer a rich science/engineering-based educational environment designed both to create aspiration towards marine engineering and develop personal/employability skills. The STEM and the Sea voyages also build on an existing collaboration between the Foundation and the 1851 Trust, furthering its potential for impact.

### Individuals that can change the world

We have a 'family' of grants that aim to provide highly-talented individuals from emerging economies with the training they need to make the world a safer place. At the International Maritime Law Institute (IMLI) based in Malta, we fund postgraduate students from developing states to gain unique legal expertise that makes them a valuable resource to policy and decision-makers in their governments. The three most recent Lloyd's Register Foundation scholars now hold senior positions within the Gambian judiciary, the Ministry for Foreign Affairs in Guyana and Kenya's Ministry of Transport. Similarly, a new grant to the University of Manchester (value £38,000) will provide scholarships for graduates from Rwanda, Uganda, Ethiopia or Tanzania to obtain much needed high-level engineering skills and prepare them to apply their knowledge to the communities in which they live and work.

### Contemporary impact of our rich heritage

The Lloyd's Register Foundation Heritage and Education Centre (HEC) is the custodian of Lloyd's Register's unique heritage collection, which contains more than 250 years of ship plans, survey reports, letter books, photograph collections and so much more. The collection is one of the great resources still available for maritime history, marine engineering, naval architecture, offshore engineering and ocean technology. This year we have shown how our collection can be put to work in line with our charitable mission and have set a goal for HEC to be "a globally-renowned resource for understanding engineering and technological innovation and its impact on society." To do this we are building on the collection's historical links to the marine sector and our safety-driven mission. We have already embarked upon an ambitious programme to catalogue, conserve, digitise and make the entire collection publicly available within three years and we are pursuing new and engaging programmes of outreach, education and research.



### Future plans

In 2020 we plan to:

- Initiate activity in response to our new challenge-led strategy.
- Start building the global evidence base to help identify where engineering capacity and capability to address safety challenges is most lacking – and work with others to understand if education and training matches current and future industry needs.
- Support new approaches to engineering education that inspire and engage participation of disadvantaged and under-represented communities.
- Build public awareness and understanding of the importance of engineering education.



### CASE STUDY

#### International Maritime Law Institute.

The International Maritime Law Institute (IMLI) based in Malta was founded in 1988 and is a world recognised centre for the training of specialists in international maritime law. In fact, in December 2018, the United Nations General Assembly recognised for the eleventh consecutive time the importance of IMLI as a centre of education and training of specialist in maritime law.

Lloyd's Register Foundation appreciates the importance of training and equipping young maritime lawyers to help their respective national maritime administrations translate International Maritime Organisation (IMO) conventions and treaties into national legal legislation and to help with their consistent enforcement. It is vital to the effective regulation of national and international shipping for IMO treaties and conventions to be implemented clearly and consistently via national laws of individual flag States. This makes the world a safer place.

Consequently, the Foundation is enormously proud of its long-standing support to IMLI, which actually stretches back to 1992, when Lloyd's Register donated some computer hardware for the use of IMLI students and staff and the first Lloyd's Register Computer Room at IMLI was opened.

Since 2002-2003 Lloyd's Register, and now Lloyd's Register Foundation, has supported IMLI through scholarships for students from emerging economies. Indeed, IMLI is establishing a formidable network of professionals – from registrar generals to chiefs of naval departments, and from ministerial positions to IMLI staff - who are rendering valuable services to our society.

We are honoured to maintain relationships with the IMLI graduates that we have supported, and we are delighted that Aleksandra Bujković, recently admitted to the Bar Chamber of Montenegro, is one of Lloyd's Register Foundation's 100A1 Ambassadors.



# Delivering public benefit.

The Foundation is governed by a Board of Trustees, which is responsible for setting the Foundation's strategy, and for ensuring good governance that fulfils its objectives – delivering public benefit.

The Board is currently made up of eight Trustees who are also the Members and Directors of the Foundation for Companies Act 2006 purposes. The Board considers Foundation policies, receives committee reports and recommendations, approves annual budgets, reviews the performance of the Trading Group, and guides the Foundation Chief Executive.

1

**Thomas Thune Andersen**  
Chairman

Thomas is the Chairman of the Lloyd's Register Foundation and Chairman of Lloyd's Register Group Limited. He is a member of the Foundation's Nominations Committee and the Lloyd's Register Group Limited Remuneration Committee. Thomas, a former member of the executive Board of the A.P. Moller-Maersk Group with more than 30 years tenure in its maritime and energy sectors, was appointed to the Board of the former Lloyd's Register in June 2010. Thomas is Chairman of Ørsted A/S, Vice Chairman of VKR Holding, the parent group of Velux and a Non-Executive Director of IMI plc and BW Group Limited. He is member of the World Economic Forum Chairmen's Council.

2

**Sir Brian Bender**  
Trustee

Brian retired from the Civil Service in 2009, having been a Permanent Secretary for nearly 10 years. His final position was at the Department for Business, having served previously at DEFRA. He is Chairman of the London Metal Exchange, and a non-executive director of Pool Reinsurance, among other posts. Brian chairs the Nominations Committee.

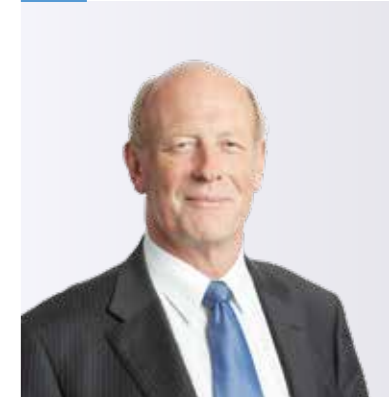
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**Ron Henderson**  
Trustee

Ron is a chartered accountant and former CFO of Network Rail and Balfour Beatty. In addition to other non-executive roles, he also served on the UK Auditing Practices Board. Ron chairs the Foundation's Audit, Risk and Investment Committee. Ron was a non-executive director of Lloyd's Register Group Limited and chair of its Audit and Risk Committee from July 2012 until December 2018.

4

**Rosemary Martin**  
Trustee

Rosemary is Group General Counsel and Company Secretary of Vodafone Group Plc. She previously served as CEO of the Practical Law Group and prior to that was Reuters' Group General Counsel and Company Secretary and a partner in the City law firm, Rowe & Maw (now Mayer Brown). She is also a Trustee of Vodafone Foundation, and a member of the Council of the University of Sussex. She was an independent non-executive of Ernst and Young and a non-executive director of HSBC Bank Plc (the European arm of HSBC Group). Rosemary represents the Foundation on the Lloyd's Register Group Limited Remuneration Committee.

5

**Carol Sergeant CBE**  
Trustee

Carol holds non-executive positions on the boards of Danske Bank AS, BNY Mellon SA/NV and Belmont Green Finance Limited. She is also a member of the Governing Council and Trustee of the Centre for the Study of Financial Innovation and a member of the Global Advisory Board of Cass Business School. She has previously been Chairman of the BSI Standards Strategy and Policy Committee, Managing Director on the board of the Financial Services Authority, Chairman of Public Concern at Work, a non-executive director of TP ICAP plc, and Chief Risk Officer at Lloyds Banking Group, having begun her career at the Bank of England. Carol is a member of the Foundation's Audit, Risk and Investment Committee.

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**Andreas Sohmen-Pao**  
Trustee

Andreas is Chairman of BW Group, BW LPG Limited, BW Offshore Limited and the Singapore Maritime Foundation. He is also a non-executive director of Singapore National Parks Board. Mr Sohmen-Pao was previously CEO of BW Group. He has also served as a non-executive director of the Hong Kong and Shanghai Banking Corporation, The London P&I Club, The Esplanade Co Ltd, Sport Singapore and the Maritime and Port Authority of Singapore amongst others. Mr Sohmen-Pao graduated from Oxford University with an honours degree in Oriental Studies and holds an MBA from Harvard Business School.

7

**Lambros Varnavides**  
Trustee

Lambros is the former Managing Director and Global Head of Shipping at The Royal Bank of Scotland. Lambros was Chairman of the Baltic Exchange during 2017 and remains on the Baltic Council and is Vice President of The Baltic Exchange Charitable Fund, as well as a member of its Finance Committee. He is a court assistant to the Worshipful Company of Shipwrights and chairs its Finance Committee. He is also a Younger Brother of Trinity House Corporation, a member of the Honourable Company of Master Mariners (including its Finance Committee) and a member of the Executive Committee of the International Maritime Industries Forum. Lambros was appointed Senior Independent Trustee of the Lloyd's Register Foundation on 29 September 2015 and chairs the Grants and Direct Charitable Activities Committee.

8

**Ishbel Macpherson**  
Trustee

Ishbel spent over 20 years in corporate finance in the City of London with BZW, ABN AMRO Hoare Govett and Dresdner Kleinwort Benson. In her last role she led the mid-market corporate finance, corporate broking, corporate broking support and investment trust teams at Dresdner Kleinwort Benson. Since leaving the City Ishbel has become an experienced non-executive director having had roles with over 10 publicly listed companies as chairman, chairman of audit committees, remuneration committees and as senior independent director. Currently, she is Senior Independent Director and Chairman of the Remuneration Committee at Dechra Pharmaceuticals plc and a Non-Executive Director of Workspace Group plc. Ishbel is also a non-executive director of Lloyd's Register Group Limited and Chair of its Audit and Risk Committee.

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