

# Curiosity, connected.

Creating safety for society  
through science, technology  
and engineering.

**Annual Review 2017/18**



Lloyd's Register  
Foundation

# We are alive with questions for a safer world.

Critical infrastructure is vital to modern society. The Lloyd's Register Foundation is uniquely placed to help improve its safety. Set up as an independent, global charity, we can act in areas beyond the remit of others, spark new collaborations and search for fresh answers.

## What we do

The Lloyd's Register Foundation helps to protect life and property at sea, on land and in the air. To do this, we support education, engineering-related research and public engagement, and promote scientific excellence.

We are not funded by the public. Our income is generated from the profits from our trading arm, Lloyd's Register Group Ltd, and investments. We meet our aims by awarding grants, acting directly and through the activities that benefit society delivered by our group, which shares our mission.



There's much to be proud of in 2018: while we're a relatively young Foundation, the benefits and impact of our grants and direct charitable activities are becoming clearly visible."

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



10

Can we predict how accidents really happen?



14

Is shipping ready for radical transparency?



18

How do you kick-start a SafetyTech sector?



20

What does the world know about safety?



24

Why does the maritime past matter?

## CONTENTS

### Introduction

- 2 Year in numbers and highlights
- 4 Chairman's statement
- 6 Foundation Chief Executive's Review

### Our four strategic themes

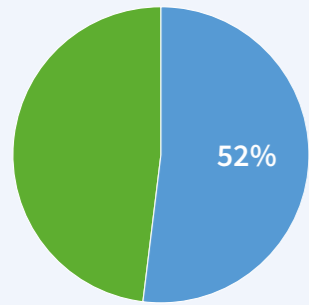
- 8 Overview
- 10 Supporting excellent scientific research
- 14 Accelerating the application of research
- 20 Promoting safety and public understanding of risk
- 24 Promoting advancement of skills and education

### Governance

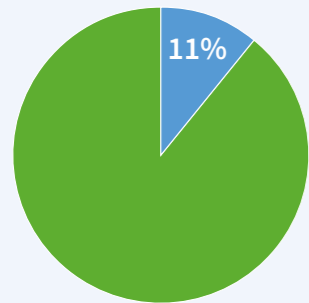
- 30 Board of Trustees
- 32 Governance structure

# 115

approaches for funding received, comprising:



60 grant applications of which 31 were successful.



55 outline proposals of which six were successful.

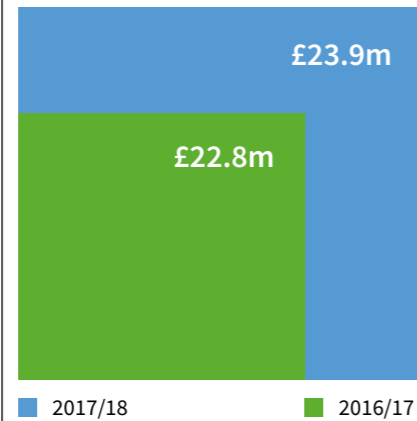
# 95%

of new awards were 'directive', led by the Foundation, and 5% were 'responsive', as a result of unsolicited approaches.

# 35

new grants awarded in year, including four requests agreed for funding additional to existing grants.

## Value of grants awarded = £23.9m



## Foundation income by source 2017/18

# more than £10.2m

## £60,000

Trading group income.

## £10.2m

Income from investments.

## Funding by strategic theme

# £23.9m

35 new awards

# £120m

Active grant portfolio at 30 June 2018

Supporting excellent scientific research	6 awarded in year Value <b>£5.82m</b>	30 active grants Value <b>£65m</b>
Accelerating the application of research	11 awarded in year Value <b>£8.04m</b>	19 active grants Value <b>£29.4m</b>
Promoting safety and public understanding of risk	5 awarded in year Value <b>£1.15m</b>	7 active grants Value <b>£11.1m</b>
Advancement of skills and education	13 awarded in year Value <b>£8.9m</b>	35 active grants Value <b>£14.5m</b>



# 1.7m

people reached to date through the 2017 Royal Institution's Christmas Lectures programme.



# 25 countries

impacted by live grants.

## Foresight Reviews and Insight Reports



# 1,230

downloads.

# 7,700

printed copies distributed.

# 3

new Foresight Reviews published in 2017/18.

# 2

new Insight Reports published in 2017/18.

## Planned digitisation



# 1.25m+

documents and artefacts.

To date

# 52,000

documents catalogued.

# 18,000

images digitised.



£120m

Grant portfolio now in action.

£27.6m

Total charitable activities in 2017/18.

390 delegates across 42 countries

At the Lloyd's Register Foundation 2nd International Conference in London, May 2018.

**“It’s a hugely exciting time for the Foundation.”**

## CHAIRMAN’S STATEMENT

**“Now in our fifth full year of operation, it is worth reflecting for a moment on the journey so far.”**

The Lloyd’s Register Foundation has achieved much in the five years since its formation, reflected in our active grant portfolio of more than £120 million, that delivers impact to society through fundamental scientific research and the acceleration of emerging technologies; the public understanding of safety and risk; and inspiring and supporting young people and under-represented communities into science and engineering careers.

Our mission at the Foundation is increasingly relevant as we enter the fourth industrial revolution with the introduction of new technologies and the convergence of physical and cyber environments. New techniques in data analytics are starting to give us real insights into global safety issues. For example, this year the Lloyd’s Register Foundation and the Health and Safety Executive (HSE), supported by the Thomas Ashton Institute, announced an ambitious new programme, ‘Discovering Safety’, which aims to substantially improve health and safety and ultimately save lives, particularly in poorer or developing nations, by harvesting and analysing the huge amounts of global incident investigation and operational health and safety data. We have also funded a unique LR Safety Accelerator programme and provided cornerstone support to the HiLo venture as well continuing our publication of Foresight Reviews.

In May 2018, we held the second Lloyd’s Register Foundation International Conference. This event showcased, through the theme of ‘Bringing safety to life’, the work of our grant portfolio beneficiaries. The breadth and diversity of the delegates reflected the reach of the Foundation, with academics, students, apprentices and leaders from government and business around the world making it a truly remarkable event.

Much of this work would not be possible without the ongoing contribution and funding from our principal operating company, Lloyd’s Register Group Limited. The Foundation’s income this year from the trading activities of Lloyd’s Register was £0.1 million, with a further £10.2 million of income from investments. The total invested in charitable activities in the year was £27.6m.

When I describe what we do, I tell people that the purpose of this unique constellation, the Lloyd’s Register family, is to save lives through the accelerated application and understanding of science, technology and engineering. We do that both through our charity, the Lloyd’s Register Foundation, which supports the research of cutting edge technologies that have the potential to have a positive impact upon millions of people, with the purpose of giving a wider understanding of how these innovations can be applied practicably to solve global, real world issues. And also through our operating group, where with our customer insight and market knowledge, we identify tangible opportunities to accelerate the application in a virtuous cycle. The Group also contributes to our charitable purpose through its everyday work in making the world a safer place. It truly is the 21st century model for social business.

The Board continues 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. It’s a simple play on words, but it means moving from thinking that people are ‘different from us’ to thinking and celebrating that people are ‘different like us’.

I would like to express my thanks on behalf of the Foundation to my fellow trustees, Advisory Council members and 100A1 Ambassadors, who give their time freely with passion and enthusiasm and are invaluable in guiding the Foundation with their expertise and wisdom.

Finally, my warmest thanks go to Professor Richard Clegg, Foundation Chief Executive, Michelle Davies, Secretary of the Foundation, and the Foundation staff, who have achieved so much in just five years.

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



**“Our uniqueness enables us to invest in those areas where we know we can make the greatest difference.”**

There's much to be proud of in 2018: while we're a relatively young Foundation, the benefits and impact of our grants and direct charitable activities are becoming clearly visible. Our unique mission and governance structure help us in delivering this, enabling us to take the long view and invest in those areas of greatest need where we know we can make a distinctive difference.

As an independent global charity, our greatest attribute and differentiator is our connection with Lloyd's Register Group Limited (LRG) as our operating entity, of which we are the sole shareholder and which provides our income. Through its networks and experience, LRG is also able to provide the Foundation with a real-world, end-user perspective on the global safety challenges facing societies to help us direct our charitable activities and accelerate results to application. Our uniqueness is our governance structure; enabling the Foundation and LRG to work together for a safer world embodying a new 21st century model for doing social business.

As a global foundation we have an obligation to focus and cluster our grants for maximum impact and to make sure we don't spread ourselves too thinly across too many initiatives. We strive to make evidence-based decisions using data analytics to identify and quantify those areas of greatest need where we know we can make the greatest difference and to measure our outcomes and impact. By clustering in this way, our larger grants can involve £10-15m commitments with planning horizons stretching over 5-10 years. This enables our grants community to leverage our investments by attracting additional funding and building communities of support around tackling some of the greatest safety-related challenges facing the world.

In line with this approach, in 2017/18 we're proud that the Foundation committed £23.9m in new science research and education grants. On top of that we also invested a further £1.7m in direct charitable activities, including the digitisation of our heritage collection and putting it to work as a unique historic and education resource. Because of the long duration of many of our grant commitments, our portfolio of live grants is building year on year. Currently, that portfolio exceeds £120m and is growing.

With the leverage contributed by our grants community, that builds to a significant scale of investment helping us to achieve the ambition set by our mission.

In 2017/18 the Foundation awarded a total of 35 grants. Most notable amongst our largest grants were: £2m towards establishing the South-East Asia Training Programme, aimed at saving more than 100,000 lives from fatal occupational accidents each year; £490,000 with Blockchain Labs for Open Collaboration (BLOC), based in Denmark for trialling applications of blockchain and distributed ledger technologies in critical infrastructures; and sponsorship of the Royal Institution's Christmas Lectures, hosted by the BBC.

Sometimes a little goes a long way and at our 2nd International Conference held in May 2018 in London - which brought together 390 people from our grants community from 42 countries on five continents - we were proud to announce that the winner of our grant holder of the year award was CHIRP Maritime, and their Aviation and Maritime Confidential Incident Reporting Programme. Their valuable work contributes to the enhancement of safety by providing a totally independent, confidential reporting system for industry employees worldwide. We're proud that our small grant of just £14,000 to support wider understanding of the effects of fatigue on safety made such a significant contribution to their success and impact.

On top of our grants there is also the direct charitable activity we funded and self-performed internally in 2017/2018. One of these, as I've already mentioned, is the digitisation of our heritage collection, consisting of over 1.25m documents and artefacts. Widening access to our collection and putting it to work as a unique education and historical resource is a wholly new venture for us. Hence, we're proud that so far we have catalogued over 52,000 documents and created more than 18,000 high resolution digital images for placing on the internet. Another direct charitable activity the Foundation funded and launched in 2018 is the Lloyd's Register Safety Accelerator aimed at bringing together technology companies and industry to test innovative digital solutions to critical safety and risk challenges. This aligns with one of the key strategic themes of the Foundation

to accelerate the uptake and application of technologies for the benefit of society. The Accelerator helps in this respect by funding pre-commercial good ideas and trialling their early adoption.

In conclusion, I want to return to the theme of the Foundation's uniqueness. While our unique mission and governance structure differentiates us, what makes us truly special is our people. I'd like to thank everybody involved including my colleagues in the Foundation and wider LRG, as well as our grants community and those who give their time pro bono to support us, including our 100A1 Ambassadors and Advisory Council members. The success of the Foundation belongs to you all.

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



**£10-15m**

commitments for our larger grants.

**£2m grant**

towards establishing the South-East Asia Training Programme aimed at saving more than 100,000 lives from fatal occupational accidents each year.

**£490,000 grant**

with Blockchain Labs for Open Collaboration (BLOC).

**£1.7m**

in direct charitable activities.



**Taking the long-term view.**

# Four strategic themes shape everything we do to improve safety.

## 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 the maximum impact.

## STRATEGIC THEMES



Supporting excellent scientific research

Find out more on page 10



Accelerating the application of research

Find out more on page 14



Promoting safety and public understanding of risk

Find out more on page 20



Promoting advancement of skills and education

Find out more on page 24

## OBJECTIVES

- Striving for excellence and impact
- Promoting technology foresight
- Building world-class research teams

- Accelerating technology uptake
- Informing standards and policy
- Facilitating the mobility of researchers

- Promoting the safety of life, property and the environment
- Enhancing public understanding of risk
- Maintaining and promoting a memory bank of safety and risk management developments

- Inspiring the next generation
- Enhancing the knowledge and skills of the workforce
- Widening access to disadvantaged and under-represented communities

## FUNDING PRIORITIES

- Structural integrity and systems performance
- Resilience engineering
- Human and social factors
- Emergent technologies

- Supporting safety organisations
- Communication and public debate of scientific research
- Developing the Foundation's Heritage and Education Centre library and archive

- Pre-university education
- University education
- Vocational training and professional development

## SECTORS WE SERVE

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

# Can we predict how accidents really happen?

The Foundation's ten-year relationship with the Research Centre of Excellence within Pusan National University (PNU) has enabled the Centre to grow its capability and capacity for pioneering marine and offshore research. Today the Centre is a world leader in modelling the unpredictability of adverse conditions affecting the performance of assets in service.



Extreme and accidental conditions and consequences are complex to address theoretically. Testing is required, using full or large-scale, physical models. There are no adequate scaling laws to convert small-scale model test results into full-scale structure responses under abnormal conditions."

Professor Jeom Kee Paik  
PNU, Korea

The Centre's vision is to prevent catastrophes by better predicting how structures respond under extreme conditions. To understand and assess the complex, uncertain and ambiguous train of events when things go wrong, the Centre champions an advanced, probabilistic approach. This is needed because accidents don't happen in a straightforward, linear way.

Over the past decade, the Foundation (along with its predecessor, the Lloyds Register Education Trust) has actively supported PNU to push at the boundaries of our knowledge of structural integrity. Cutting-edge research has been turned into transformative design and software applications for industry. As a direct result of our funding and support, we have seen the adoption of key patents that have improved safety at sea. This has included developments in gas detection, fire walls and heat shields, and we are now more informed than ever on how structures respond to abnormal, complex, nonlinear events. From collisions, groundings and explosions to rogue waves, corrosion, ageing and accidental denting, through the Foundation-funded work of PNU, industry is now better equipped to anticipate and respond to such incidents.

In creating advanced methods which can more accurately predict extreme and accidental events in shipping and offshore structures, the researchers we support are able to explore new ideas with expert leaders and contribute to the creation of innovative solutions. We are becoming increasingly aware that great ideas do not happen in isolation. They are the product of often unforeseen combinations made possible in collaborative environments.

Our investment not only supports engineering advances, but also has significant impact in terms of human capital. The Centre plays an important role in educating engineers of the future and securing the supply of expertise that is greatly in demand the world over. The last five-year period has seen the Centre support 93 MSc and 70 PhD students from across the globe, the majority of whom have gone into professional careers within the maritime industry or into academia.

To accelerate the application of work to date, the Foundation continues to support research and skills development at PNU with a follow-on grant of £0.5m

#### Behind a rare new test facility with an open agenda

During the last grant period, the Centre at PNU identified a critical safety need: that to effectively validate newly developed approaches, modelling needs to be tested at full or large scale. This is difficult to achieve in standard laboratories; very few research facilities in the world have the ability to house such large tests. Building on the Foundation's support, the Centre was able to leverage £77 million in funding from the South Korean Government to build large-scale test facilities on a 231,000 m<sup>2</sup> site. The test facility, known as the Korean Ship and Offshore Research Institute (KOSORI), is now up and running. An additional £0.7 million grant from the Foundation will help in two ways. It will open access to the facility and make valuable data from large-scale KOSORI tests available for the benefit of the wider maritime community.

#### Growing tomorrow's engineers:

- 7 in 10 MSc graduates are now working in industry
  - 3 in 10 are advancing scientific knowledge through PhDs supported by the Centre
- 2013-17 figures

#### The knowledge ripple effect:

- 176 journal and conference papers
- 14 patents
- 2 books

produced by the Centre between 2013 and 2017



## Highlights

### Progress on what we set out to achieve

In our review of 2017 we set out our plans to publish a Foresight Review on design for safety, Insight Reports on distributed ledger technologies and on additive manufacturing, and initiate new activity informed by foresight and insight processes.

The Royal College of Art launched the Foresight Review on design for safety at our international conference in May 2018. We also launched two Insight Reports: one on safety in the fishing industry and another on safety in the passenger ferry industry. Both Insight Reports build on the findings of the Insight Report on global safety challenges that was launched in June 2017, providing an overview of the topic areas and making recommendations on distinctive ways in which the Foundation can make a distinctive difference.

During the year we planned to publish an Insight Report on additive manufacturing but anticipate achieving this in the coming year.

## May 2018

Royal College of Art launches our Foresight Review on design for safety to explore how a culture of design for safety can enhance the safety of the world around us.

### Promoting scientific foresight

The Foresight and Insight Reports published in the past year continue to demonstrate how the process can build new networks of experts around a topic area. They provide the Foundation and society with the information required to initiate positive steps in enhancing safety.

#### Foresight Review on design for safety

The review led by the Royal College of Art identified how failures and accidents in the designed world have occurred due to a failure to consider the bigger picture; the combination of technology, people and conditions. The review highlights how emerging industries face new and sometimes unknown safety challenges and proposes how to address these through international collaboration.

#### Foresight Review on global safety evidence

This review explores current data sets and methodologies used to understand the state of global safety. It explores how such data is used and what the trends and challenges will be in the future. It highlights difficulties in collecting comparable quality data, the need for predictive indicators to support preventative action, the need to develop more mature health and welfare analytics, and the opportunities arising from new technologies and data analysis methods.



### Insight Report on distributed ledger technologies

This report is issued jointly with the Alan Turing Institute, providing further Insight into our previous Foresight Review on big data. It explains what distributed ledger technologies are and how their application in supply chains and infrastructure can enhance safety and increase transparency.

### Insight Report on safety in the fishing industry

This report builds on the recommendation of the Insight Report on global safety challenges which identified fishing as one of the most dangerous industries on earth. This review digs deeper to understand where and why the majority of fishing tragedies occur and how it is possible to start saving the estimated 24,000 fishermen who die every year.



### Insight Report on safety in the ferry industry

The ferry industry was identified in the global safety challenges Insight Report as having unacceptably high casualty rates. This report identifies prone geographies and reasons for fatalities and what steps can be taken to significantly reduce these numbers.



### ICON

The International Consortium on Nanotechnology has grown its community to support 35 PhDs across the globe. One of the 2nd year researchers, Zahra Andaji-Garmaroudi, who is studying at Cambridge University, has had her paper published in the science journal Nature.

## 24,000 lives

are estimated to be lost to the fishing industry annually. Our Insight Report on safety in the fishing industry explores what can be done to start saving lives.

### CEARCTIC

The CEARCTIC consortium, led by Aalto University, has performed the validation of the new Polar Code risk index approach: establishing the link between the risk index and level of safety of Arctic shipping. The consortium has also established the safe ice conditions for ships designed by Finnish-Swedish ice class rules in Polar ice conditions, for both independent navigation and navigation behind an icebreaker. Finally, the consortium has updated the definition of the limit states to be used in the structural design of Arctic ships.



Safety insights can help save lives. The Foundation has a unique opportunity to influence positive steps towards a safer world.”

**Dr Jan Przydatek**  
Associate Director of Programmes, Lloyd's Register Foundation



### Our plans for 2018/19

- Consult and publish Foresight Reviews on the future of ocean engineering, the future of food safety and cybersecurity.
- Investigate and report on global safety challenges.
- Initiate activity informed by the recommendations of fishing and ferries and other Foresight and Insight publications.
- Increase collaboration between our grant holders.
- Following the launch of our energy storage Foresight Review, from its findings we will identify a unique white space in which the Foundation could consider grant funding, in line with our mission and strategy, where other funders are not active.

# Is shipping ready for radical transparency?

Blockchain has the potential to revolutionise many different sectors, including the global maritime industry. To get ahead, the Foundation is supporting Maritime Blockchain Labs (MBL) to explore how these technologies can transform the assurance and safety of shipping's critical infrastructure, and drive new business models.

The Foundation sees significant opportunity for blockchain technologies to help in the safety business. Described as fundamental for forward progress in society, blockchain's capability to provide an auditable, cryptographically secure and immutable log of activities across a computer network could radically rethink the way business operates, especially for supply chains. With different parties able to securely record and share trusted data between themselves ultra-efficiently, a new level of traceability and transparency emerges, based on a system that is 'self-policing'. Several applications for engineered systems are already emerging as highlighted in the Foundation's published Insight Review on distributed ledger technologies (DLTs), with The Alan Turing Institute. Blockchains are a form of DLT and a good example includes the tracking of food products through a supply chain to provide clear evidence of their provenance.



Shipping, a traditional industry, has much to gain from adopting blockchain if its effectiveness can be proven. Processes between parties are in many cases archaic, with complex and opaque supply chains. Exploiting the key characteristics of blockchain technologies can help the shipping industry address major risk and safety challenges, including staying compliant with regulations.

The Foundation is supporting MBL to determine where blockchain technologies can enable breakthrough solutions: a world-first maritime collaboration. As a founding member and lead funder, our support follows on from recommendations in our DLT report. MBL (a subsidiary of technology and governance experts, Blockchain Labs for Open Collaboration, or BLOC) will take an industry-led approach to identifying, designing and testing solutions. It will then develop the technology to ensure these solutions are relevant and used. Over the next 18 months, Foundation money will provide resources for MBL to pursue three demonstrator projects.

MBL's work will also help to establish an inclusive maritime blockchain community or ecosystem. This will foster innovation and collaboration between blockchain practitioners and industry, share knowledge and best practices, collectively define problems and shape solutions that are open and interoperable.

## Real progress on a pressing issue: the Fuel Bunkering Demonstrator

Following wide industry research, the Foundation and MBL identified the bunker business as an ideal first challenge with its multiple, complex transactions from supplier to bunker delivery. The shipping industry knows only too well the cost of poor quality fuel to safety, as well as operational and environmental performance. Adding to this picture is the need to meet ever-tougher regulations around decarbonisation. The industry quickly needs a trustworthy framework for accurately monitoring emissions, notably the sulphur and carbon that shipping produces.

The initiative's first project – the Fuel Bunkering demonstrator – will explore how blockchain technologies can benefit both maritime fuel buyers and regulatory bodies by providing an efficient, tamper-resistant and auditable chain of custody. Leading this project is an industry consortium. Each member represents a different party in the marine fuels value chain or wider shipping industry, contributing their expertise and insight as the consortium builds and validates the use of blockchain in this pressing area.



A consortium approach is essential due to the need for cross regulatory boundaries and to work within different organisational bodies and systems. Too often ... we see a top-down approach where new technology is pushed on the industry. However, this means that complex human and governance elements are ignored, limiting the eventual adoption and usefulness of the technology.”

Deanna MacDonald  
CEO and co-founder, BLOC

## Highlights

### Progress on what we set out to achieve

Last year's review outlined our plans to improve the impact of the work we fund by working more closely with Lloyd's Register Group to benefit from its insights into real world problems, its network of customers, and the experience and skills of its staff around the world. The Lloyd's Register Accelerator is one example of this, as featured on page 18.

### Our charitable activities and new grants

#### National Structural Integrity Research Centre (NSIRC)

Our grant to NSIRC is now funding more than 30 PhD students with the first Foundation-funded student, Dr Laura Vivar, graduating in March. The research at NSIRC continues to be driven by real world problems. To this end, an additional ten PhD projects have been agreed, which will start in the new academic year.

In order to accelerate the application of research carried out at The Welding Institute (TWI), TWI and Lloyd's Register Inspection Ltd have formed a joint venture called Fullagar Technologies Ltd which aims to pull research through into new products and services.



**Our funded research enables closer contact between academia, industry and start up organisations."**



**Dr Ruth Boumphrey**  
Director of Research,  
Lloyd's Register Foundation

#### Data centric engineering programme - Alan Turing Institute

Mark Girolami, the Director of the Foundation's Data Centric Engineering Programme, was awarded a five-year Royal Academy of Engineering (RAEng) Chair in recognition of his work which supports better industrial decisions on safety. Significant leverage has been achieved from other funders and the programme is making strong advances in its three overarching challenge areas: resilient and robust infrastructure; monitoring of complex systems; and data driven design under uncertainty.

#### Resilience Shift

The Resilience Shift – our major Resilience Engineering programme in partnership with Arup – published the results of its first studies this year and held the first round table meeting of global engineering practitioners. It has identified three workstreams: ways to make resilience tangible, practical and relevant; incentivising resilience; and applying resilience practice within and between critical infrastructure sectors.

#### Assuring Autonomy International Programme

This programme, led by York University, has rapidly established its governance structure and processes, initiated some fundamental assurance activity and awarded funding to four international demonstrator projects: autonomy in open cast mining operations (Sweden); safety-related human-robot interaction in manufacturing (Italy); automated moving robots in the hospital environment (UK); and autonomy of medical infusion pumps (UK).

#### RECBIT, safer systems through genuine electronics

The Foundation has awarded a grant to a researcher at Cranfield University who is using existing technology in a new way to develop a fast and simple batch testing method for electronic components. If successful, the test will check for counterfeit or faulty components before they enter systems, the failure of which can have catastrophic consequences.

#### nPlan, avoiding accidents through data

Construction schedules allow companies to plan the complex tasks associated with projects. They are flexible to cope with the real world. Using health and safety reports, together with construction schedule records, nPlan are using data analytics to identify if there is a link between construction schedules and accidents. If such a link can be shown, it has significant potential in predicting and avoiding future accidents.

#### MX3D, a bridge to safe technology deployment

Our grant to MX3D is turning the world's first metal 3D printed pedestrian bridge into a living laboratory using sensors, digital twins and data analytics to demonstrate the ongoing safety of this new technology. MX3D have leveraged more than £3 million of additional funding and captured the imagination of more than one million people on social media and the press.

#### Making the skies safer: Supporting General Aviation Pilots

The Foundation is supporting the acceleration of Dr Elena Psyllou's research following her graduation from the Lloyd's Register Foundation Transport Risk Management Centre at Imperial College London. This project will work with general aviation pilots and their regulators to introduce new training and the use of widely available tablet technology to allow safer navigation; initially starting in Canada where 140 general aviation accidents occurred in 2016. There is also a plan for further expansion including in China, the fastest country for aviation growth.

#### Supporting PRESLHy – Pre-normative Research for Safe use of Liquid Hydrogen

PRESLHy is a major international project developing essential understanding of the hazards and risks of liquid hydrogen (LH2) to enable safe introduction to public use, scale-up of production of LH2 as an energy carrier and safe transportation including shipping across international borders. Through this research, the project will provide new essential knowledge and close many safety related gaps. Foundation funding supports experimental and modelling projects, examining factors associated with mixing and releasing, ignition and combustion of LH2 and transference into Regulations, Codes and Standards (RCS).

#### Maritime Blockchain

Following the recommendations in the Insight Report on distributed ledger technologies, the Foundation is supporting Maritime Blockchain Labs (MBL) – see page 14. As its first demonstrator, a consortium will evaluate how blockchain technologies could help to provide an efficient, tamper-resistant and auditable chain of custody on maritime fuel.



### Our plans for 2018/19

- Initiate major new programmes addressing the safety of complex systems and end of life and decommissioning in engineered systems. These will be in partnership with the Royal Academy of Engineering.
- Make the first awards under the Lloyd's Register Safety Accelerator programme in partnership with Plug and Play.
- The first demonstrators will begin in the 'Assuring Autonomy' programme led by the University of York.
- Initiate a programme in partnership with the National Cyber Security Centre to support board level decision making in cyber security.

**30**  
PhD students

now funded by our grant to NSIRC, whose research continues to be driven by real world problems.

**140**  
aviation accidents

occur annually in Canada alone, so we're accelerating Dr Elena Psyllou's research project there, working with general aviation pilots and their regulators to introduce new training and ensure safer navigation.

# How do you kick-start a SafetyTech sector?

The Lloyd's Register Safety Accelerator, a strategic partnership between the Foundation and Lloyd's Register Group, introduces tech startups to safety-critical industries and vice versa. Working together, new partnerships will test innovative digital solutions to the world's toughest safety and risk challenges.

Technology has made huge differences to all sorts of areas of business, and people are familiar with using it; world safety can also benefit, much like the global financial services industry has with the growth of the FinTech sector. With smart solutions already out there ready to be repurposed, the challenge is speeding up technology's adoption in a conservative marketplace.

The Lloyd's Register Safety Accelerator aims to remove barriers preventing industry uptake of cutting-edge safety and risk solutions. To do this, the Accelerator will work with LRG clients and key industry players to identify areas of operation with critical safety and risk issues. Partners will then be sought to define the challenges and run pilot trials; this is the first half of the programme. Matching up challenge partners with the right digital technology innovators is the other part of the initiative. These providers are scattered around the world and, at present, solving safety problems is not on their radar. To link up new collaborations, the programme will work closely with Silicon Valley-based partner, Plug and Play. The technology champion will tap into its global network of startups to identify and connect innovative companies with the programme. Established in 2006, Plug and Play has a proven track record in making technological advancement happen fast.

The Lloyd's Register Safety Accelerator provides the opportunity for industry partners to be early adopters of – and leaders in – innovation, without the associated financial risk. It also offers technology companies both funding and a route to market. Securing the first customer for startups is pivotal to success. In these ways the programme addresses the main issues that stop technology from being used to improve industrial operation.

## The startup selection process

Technology businesses wanting to apply existing digital solutions to safety will be invited to apply for funding to trial these products in an industrial environment, through Accelerator collaborators. Startup finalists will then pitch their solutions at quarterly 'Innovation Days' (in the spirit of Dragon's Den, the British TV programme, linking new ventures with sources of funding).

The most promising teams and proposals will be awarded trial funding by the Lloyd's Register Safety Accelerator to work alongside major industry partners to pilot their technology.

Human safety on board ships and floating platforms will be one of the first safety challenge themes. Applications addressing this challenge area open in summer 2018.

## What is an accelerator?

Accelerators focus on accelerating growth and scaling a business. They are different from incubators, which incubate disruptive ideas with the hope of building out a business model. The Lloyd's Register Safety Accelerator aims to create a SafetyTech community and, by doing this, accelerate growth and innovation within safety and risk. A further objective is to make safety a well-known innovation space, so bright technology minds are attracted to it.

6,000 startups

20 locations globally

Plug and Play's leading startup ecosystem



By combining Lloyd's Register's expertise and extensive footprint in safety-critical industries, the Foundation's deep understanding of global industry challenges and our startup knowledge, we plan to create and promote a SafetyTech market that brings the world's best startups and corporations together to make the world a safer place, one pilot at a time."

Michael Olmstead  
CRO, Plug and Play

# What does the world know about safety?

The Foundation's Foresight Review on global safety evidence explores the current data we have, how those data sets are used and what the trends and challenges are for the future evidence base for safety. It is the starting point in developing a resource for all: a global safety outlook for a safer world.

At an individual level, nothing is more important or emotive than our safety; our ability to keep ourselves and our loved ones well and out of harm's way. We need good data and intelligence on what causes harm – at a global, national, industry, community and individual level – to learn from safety failures and improve in the future. Excellent data is essential; each safety failure is an opportunity to know more to prevent future harm.

The Foundation's latest Foresight Review addresses a subject close to our heart. Lloyd's Register's origins lie in the publication of global safety evidence. The Register of Ships was a trusted source of public information, informing stakeholders' decisions. More than 260 years later we live in a global data age. Yet despite advances in data collection, reporting and analysis, there are still large knowledge gaps, especially in the poorest parts of the world. Improved data is required to make better decisions and target resources where they are most needed. Coupled with data gaps is a changing world: supply chains are increasingly complex, workers move between sectors and countries, and technology enables fresh ways of working. Different approaches in capturing safety data have strengths and weaknesses, with innovative

data collection methods and analytical techniques offering new opportunities for safety and risk insights to help us understand, monitor and prevent harm.

Beyond the complex and varied data landscape, our Foresight Review reveals wider considerations. Industries need to factor in the changing way in which decisions are made and the needs of the community for predictive indicators to prevent harm and not just record it. Our research also challenges the very definition of safety data and whether this should be more closely aligned to people's health as the understanding of safety matures. Alongside tackling safety issues right now, there is a new opportunity to be more predictive, preventing potential problems happening later down the line.

The Foresight Review on global safety evidence was a partnership between the Foundation and the UK's Health & Safety Executive (HSE), being led by Professor Andrew Curran, Chief Scientific Adviser and Director of Research at HSE. It draws on an international range of experts from many sectors and with different perspectives through interviews and desk studies.

## Recommendations from the Foundation's Foresight Review

- **Use existing data sources to identify and communicate global safety priorities** and opportunities to continuously improve and enrich available safety data and intelligence.
- **Identify evidence-based interventions and research** that can be made by the Foundation, in collaboration with others, to improve world safety outcomes.
- **Make global safety analysis and data accessible** for public use.
- **Scope education** and development programmes for the global community.



There is much to be done if jobs around the world are to be safe and this review will shape what we do as a Foundation. Over the next year we will respond to the report's recommendations by convening international partners. This will help us establish a capability to serve society's changing needs for safety evidence."

**Dr Ruth Bounphrey**  
Director of Research, Lloyd's Register Foundation

## Sharing key findings

- **Data quality and reliability varies widely** in systems generating data at government, sector and company level, with some countries lacking any functioning systems for health and safety data collection and disclosure.
- **Non-safety specific data sets can provide a critical context for safety**, such as GDP, the existence of regulatory and enforcement frameworks, transparency and the rigour of notification systems, investments in education and health outcomes.
- **Predictive (leading) indicators will have more impact than lagging indicators** of health and safety performance, and improved data collection.
- **Health and safety and chronic disease should be considered together** in seeking to understand and track leading indicators of safety.
- **The need to capture and understand data from weak signals, near misses and emerging patterns** related to safety performance as well as intelligence from a smaller number of high impact, high profile catastrophes.
- **Unstructured data and new analytical techniques** can help us identify a range of health and safety performance indicators.

## Highlights

### Progress on what we set out to achieve

Our plans for 2017/18 included the delivery of our Foresight Review linked to our global safety outlook project, launching the next steps in our global safety challenges programme and working with the National University of Singapore to appoint the first Director of the Lloyd's Register Foundation Institute for the Public Understanding of Risk (LRFI).

We have made excellent progress in most of these areas and have retained our flexibility to deliver on other exciting opportunities that arose in the year; however, recruiting a new LRFI Director has taken much longer than we anticipated. Consequently, operational delivery at the new Institute has been slow to accelerate. We now expect this to ramp up in 2018/19 and are delighted that the World Bank has selected LRFI to host the Understanding Risk Forum in May 2020 (UR2020).

**£14,000 award**

**allows CHIRP Maritime and UCL to produce a study on 'Perception, Decision Making and Fatigue at Sea', with over 60,000 printed copies distributed within three months.**

### Our charitable activities and new grants

#### Global safety challenges

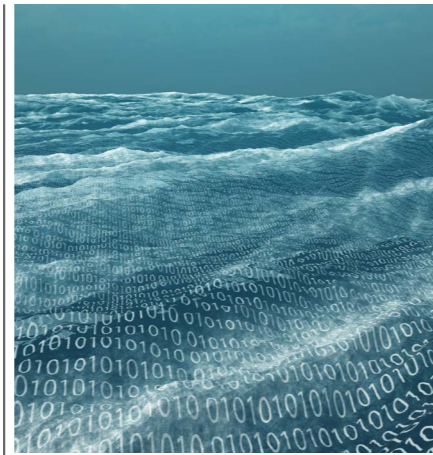
- Fishing and Ferries Insight Reports
- Complex Systems
- End of Life/Decommissioning

#### Bringing Safety to Life

The Foundation held its second international conference in London on 9-10 May 2018. There were more than 30 presentations drawn from our grants community and network that really highlighted the breadth and importance of the work that we support. More than 300 delegates were engaged by our speakers who included apprentices, interns, PhD students and high profile key note speakers: Richard Judge, Saiful Islam, Sir Mark Walport, Adam Parr and Louise Kingham.

#### Reaching around the world

Our support for a science editor at The Conversation, a news and analysis website, has led to a significant increase in its science, technology and engineering coverage. Articles attract an average of 850,000 page impressions per month and have included numerous pieces that tackle specific areas of Foundation funding, including resilience, safety and regulation. As part of our grant we are funding The Conversation's first paid internship programme. As well as providing great experience for those at the beginning of their career, the programme will result in more articles that closely align with the work we fund.



#### Discovering Safety

This programme aims to create knowledge from accident investigation data using data mining. Every year huge amounts of incident investigation findings and operational health and safety data are collected globally. The Foundation and the Health and Safety Executive (HSE), supported by the Thomas Ashton Institute are running an ambitious new programme called 'Discovering Safety' which aims to substantially improve health and safety and ultimately save lives, particularly in poorer or developing nations.

The team has been working with industry, trade groups, international networks, governments, academia and other stakeholders to identify health and safety challenges and opportunities where deeper insights from data could make a significant impact. Important questions emerging from this work include 'How can we learn more about the root causes of product safety failures?' and 'What are the causes and circumstances leading to loss of containment accidents in high hazard industrial sites?'

These and other questions will be explored in a multi-disciplinary effort which will develop new techniques to aggregate and analyse health and safety data from sources around the world. The work will be to understand how to access and use the data available and apply leading expertise in data science, data analytics, artificial intelligence and machine learning. Much of the work will be underpinned by advances in areas such as text mining and language processing which are expected to have important spin-off benefits.

#### HiLo

Accident reports often describe a number of contributing indicators. A collaboration between Shell, Maersk and Lloyd's Register Consulting has developed and tested a practical system for capturing indicators before an accident happens and using data analytics to turn these into precursors that provide warning in advance of a problem to individual ships and fleets of ships. The Foundation is funding the expansion of the HiLo system across the shipping industry, helping to avoid predictable accidents in the future.

#### Safety and Fatigue at Sea

We are proud to support the CHIRP Maritime programme, which provides a free, confidential service to report near misses and hazardous occurrences at sea. Lessons learnt are shared with 200,000 seafarers every year. In 2017 we awarded an additional small grant of £14,000 that allowed CHIRP Maritime and UCL to produce a study on 'Perception, Decision Making and Fatigue at Sea'. The findings were launched in January 2018 and in the first three months alone more than 60,000 printed copies were distributed. This paper has been endorsed by the Secretary General of the International Maritime Organisation (IMO) and the US government agency MARAD who distributed it through the entire US maritime network.

### Emergency Preparedness: methodology, international best practices and applications in China

In China industrial accidents have occurred frequently in recent years and a lack of emergency preparedness and response caused significant losses. This research, supported by the Foundation, provides input to the emergency preparedness legal framework to establish relevant standards and methodology and to improve emergency preparedness and response capabilities. The results will be shared in the region.



### Our plans for 2018/19

- Scope and publish a Foresight Review on cyber and safety.
- Revisit our community to ensure that our known global safety challenges are up-to-date.
- Act on the recommendations of our Foresight Review on global safety evidence.
- Foster innovation in safety data sourcing and analysis.



**Safety is a human right: building greater understanding of risks will in turn build a safer society."**

**Richard Clegg**  
Foundation Chief Executive



# Why does the maritime past matter?

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. In the past year, the Foundation has been exploring ways the collection can be used in pursuit of our charitable mission.

## Supporting our purpose today

For the first time we have been working with a set of narratives for our research and education initiatives.

1. Development of ship and yacht building since the 1800s.
2. Impact of the maritime sector on world trade and trade routes.
3. Safety at sea.
4. Depiction of maritime technology in art.

These narratives will enable us and others to make the most of our unique collection, look at broader socio-economics beyond maritime history, focus on benefits to society in areas important to the Foundation and engage wider audiences with our archive, including the next generation.

## Informing contemporary issues

The Foundation has agreed a grant of £500,000 to fund a Curator of Contemporary Maritime Impacts at the National Maritime Museum. The curator will promote public awareness and understanding of the connections between maritime history and contemporary maritime issues – from trade and migration to technology. The role will draw upon the Centre's collection and benefit from Lloyd's Register's first-hand knowledge and experience of industry issues, providing us with an end-user perspective. This is an exciting first for both the Foundation and the renowned museum.

## Inspiring new research into safety

The Foundation is funding the first-ever postgraduate research scholarships to focus on the Centre's collection and archive. Two Lloyd's Register Foundation Thomas Chapman Scholarships (named after the organisation's longest-serving Chairman) will investigate ship design in the mid-nineteenth century and focus on safety measures in the distant-water trawl fisheries since the 1900s.

We have also encouraged small-scale research projects that will use the Centre's collections. Once more of our digitised material is available online (see over the page for details on this project) another call will be aimed at universities, libraries and archives later this year. These activities are all part of our Opening Access to the Heritage and Education Centre Programme.

## Reaching out

The Foundation has awarded a small grant to the 1851 Trust, the charitable arm of the America's Cup yacht racing team. The Trust is using some of our yacht plans and survey reports in their education programme and has reached more than 1,000 young people in the UK. We are also exhibiting the collection for the first time; Waterproof: Safety at Sea is at Rotterdam Maritime Museum and showcases Lloyd's Register's role in developing maritime safety and its 150 years of work in the Netherlands, including some Foundation-funded projects. The exhibition runs until June 2019.

The Centre's team will continue to grow a programme of evening and lunchtime lectures, enabling more people from diverse audiences to contribute to our understanding of our archive and collections. The year's highlights include the annual Proctor Lecture, which we host, and a collaboration with Museum of London Archaeology.



Students attending one of the 1851 Trust's roadshows. Our yacht plans from the 1930s were used as part of a STEM educational activity.

## Greater impact

The Foundation's vision for HEC is that it will be a globally renowned resource for understanding engineering, technological innovation and maritime history, and its impact on society. To do this we will build on the collection's historical links to the marine sector and our safety-driven mission.

## Highlights

### Progress on what we set out to achieve

Skills and education cuts across all areas of the Foundation's strategy. Hence many activities in other parts of the strategy often contribute in one way or another to delivering the Foundation's skills and education mandate. Examples include our funding of scientific research, which produces highly trained graduates and academics, and our Public Understanding of Risk programme, which contributes towards public education.

The reach of the Foundation's skills and education grants is impressive and growing. Currently our skills and education grants and direct charitable activities benefit students, parents and teachers in more than twenty countries, all making a notable contribution to our international impact.

The size and mix of the education and skills portfolio is growing in line with implementation of the Foundation's Five Year Plan. In last year's annual review we revealed our updated priorities for Skills and Education as set out on this page.

**3,751**  
RNLI lifeboat launches.

**3,743**  
people aided.

**85**  
lives saved.

2017 RNLI figures for stations supported by the Foundation

#### Skills for Safety:

Improving safety standards in targeted sectors and communities through education and training programmes that enhance employability and the capacity to practice engineering safely.

#### STEM for Unsupported Communities:

Increasing the numbers of disadvantaged and under-represented young people choosing STEM-related jobs by driving quality STEM education programmes and improving learning outcomes.

#### Skills for Emerging Technologies:

Building on our published Foresight Reviews and Insight Reports, accelerating the adoption of new technologies through thought-leadership and new designs of engineering education programmes that address emerging technology skill needs relevant to LR and the global workforce.

#### Skills for Innovation and Entrepreneurship:

Driving the uptake and application of technology and research by developing more innovation-ready engineers.

#### Alumni:

Tracking the long-term impact of Foundation funding and spreading our influence and values through a programme of engagement with beneficiaries of our funding.

#### Heritage and Education Centre:

Becoming a world-class resource for understanding maritime history and technology by funding new research and education programmes based on our unique heritage collection.

We stated our intentions to use these new priorities to increase our international reach and connect skills and education activities across all parts of our mission. We are making good progress with these plans, notably by directing more activity through the Heritage and Education Centre and through two large grants that will significantly increase the proportion of our international skills and education funding. We would, however, like to have delivered more, particularly for our alumni and in more specific follow-up to our Foresight Reviews. Next year we will focus more carefully on delivering against all our priority areas.

### Highlights from our charitable activities and new grants

#### Saving Lives in South East Asia

The latest available data shows that fatal occupational accidents in South East Asia are increasing, which is probably caused by the relatively rapid construction of new critical infrastructure. As a result we are funding a new skills and education initiative: the South East Asia Training Plan (SEATP) that aims to drive down the rate of fatal occupational accidents in South East Asia, and so contribute to saving more than 100,000 lives per year. The programme will be led by The Welding Institute (TWI), who the Foundation have awarded a grant of £2m to provide bursaries for training that will enhance capacity to do safe engineering in Indonesia and India. The programme will improve safety associated with the construction of new critical infrastructures across a range of industries, including transport, power generation, marine and oil and gas. Training will not only provide technical skills vital to maintaining structural integrity but also enable participants to ensure that infrastructure will be safer and last for many years into the future.

#### Engineering Skills Where They Are Needed Most

We are building on the skills and education recommendations within our Foresight Reviews and recognise that low income and newly-industrialised countries require huge amounts of investment in infrastructure upgrades and the adoption of (emerging) technologies to accommodate their growing populations and economies. This is a distinctive space for us to make a unique contribution in the area of safety through development of local engineering skills. We have awarded a large grant to the Royal Academy of Engineering (RAEng) that will enable us to identify and make interventions that are impactful and sustainable.

#### Fire Engineering

We have awarded Stellenbosch University £165,000 to develop the first-ever fire engineering postgraduate programme in Africa. Our grant will provide the foundation for a taught curriculum, as well as supporting research and knowledge transfer

to industry. We expect to see development of knowledge that is crucial to African fire-engineering challenges (such as informal settlement fire behaviour), leading to improved fire safety and integrity of critical infrastructure in Africa.

#### Promoting Lifelong Engagement with Science and Engineering

In the last review we highlighted our support to the 2016 Royal Institution's Christmas Lectures. We have since awarded a grant of £455,000 to support the Christmas Lectures programme until 2020, reaching new and more diverse audiences for STEM education, both in the UK and internationally. The new programme aims to create a pathway of lifelong engagement through new events and activities that will build on the content of the Lectures. It also helps us to extend our influence and reach, building a reputation for distinctive and high impact support of science and engineering education.

#### Boosting International Collaboration

Foundation support to the National Space Academy continues to significantly enhance its international profile and impact. A new UK-China Centre for Space Education and Space Culture has been established, with UK leadership from the Academy. This will provide the opportunity to develop new international education experiments that will fly on China space missions and broaden the joint programme's impact to include developing countries across Asia and Africa.

#### Saving Lives at Sea

We are very proud of our association with the Royal National Lifeboat Institution (RNLI). Our funding has now allowed the essential sea survival training of more than 3,000 new RNLI crew members, a milestone we recognise as testimony to the incredible dedication of the RNLI and their volunteers. In 2017 lifeboats from RNLI stations supported by the Foundation launched 3,751 times, aided 3,743 people and saved the lives of 85 people.

#### Science Education in Challenging Environments

Our grant to the Educational Volunteers Foundation of Turkey (TEGV) has supported the 'Science Firefly', a mobile unit that travels under a MoU with the Turkish Ministry of Education to remote and disadvantaged regions of Turkey. It delivers an inspiring science curriculum and training, tools and

materials that will promote quality science education. As a result, nearly 3,500 children each received 12 hours of engaging science education that will be sustained by new skills that are provided to their teachers.

#### Enhancing Safety through Law

At the International Maritime Law Institute we fund individuals from developing states to gain unique legal expertise that makes them a valuable resource to policy and decision-makers in their governments. For example, Foundation supported students have recently gained influential positions in Tuvalu, the Ukraine and Sierra Leone, enabling greater participation by these states in the major international maritime law conventions and legal instruments.

#### Safe Design

We are seeing some great outcomes as a result of the Safety at Sea project (our pilot Global Safety Challenge). Since September, the RCA have presented the project at the UK Maritime Pilots' Association (UKMPA) annual conference and at major design education and research conferences in Norway, USA and China. UKMPA delegates were particularly keen to help further develop the innovative ship-to-ship transfer prototypes towards application. In addition, the RCA are now actively considering the implementation of a novel postgraduate degree in 'Design for Safety'.



**£2m grant**  
for a programme led by The Welding Institute to provide bursaries for training that will enhance capacity to do safe engineering in Indonesia and India.

**Tim Slingsby**  
Director of Skills and Education

### Our plans for 2018/19

- Deliver an investment appraisal for our Heritage and Education Centre, with recommendations for how we can maximise the impact of Lloyd's Register's unique and valuable heritage.
- Initiate a major new programme in partnership with the UK Royal Academy of Engineering.
- Investigate how we can distinctively act to inspire more young people towards engineering.
- Consult and publish skills and education Insight Reports based on recommendations of completed Foresight Reviews.

**“**  
Developing engineering-related skills promotes critical thinking, science literacy and the next generation of innovators.”





# Digitising our maritime history for tomorrow's use.

'Project Undaunted' is an ambitious, three-year initiative to digitise 120,000 plus documents from Lloyd's Register's archive.

### Cutty Sark at a scroll: Widening access to our collection

So far the team at the Lloyd's Register Foundation Heritage and Education Centre has catalogued more than 50,000 ship plans and survey reports, and scanned more than 17,000 documents. These records are now conserved for the future and will be freely available on our new website. This exciting resource will open up our collections to new audiences. For the first time, users will be able to search across the archive and library collections, linking up historical sources and making new connections.

The initial materials available online will cover first-of-a-kind and famous ships, from the *Bakuin* to the *Cutty Sark*, *Fullagar* and *Mauretania*.

### Why Undaunted?

The project is named after the survey report of the barque, *Undaunted*, marking a landmark in Lloyd's Register's history. The survey was carried out by Nathaniel Middleton on 1 July 1834.

### Shown here from our collection:

Plans of mast steps for the steel four-masted barque, *Ama Begoñakoa*, built in 1902. She was later named *Medway* and used as a sail training ship.

“The new website is such a change for us in terms of our public engagement and outreach, inspiring people to use the collection and be inspired by the collection.”

**Victoria Culkin**  
Head of the Lloyd's Register Foundation Heritage and Education Centre

**1,100%**  
more pages on the Centre's new website.

# 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 seven 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.



**Thomas Thune Andersen**  
Chairman

Thomas Thune Andersen 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 Non-Executive Director of BW Offshore Limited and IMI Plc.



**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, a governor of Dulwich College and a non-executive director of Pool Reinsurance, among other posts. Brian chairs the Nominations Committee.



**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, is a non-executive director of Lloyd’s Register Group Ltd and chairs its Audit and Risk Committee.



**Rosemary Martin**  
Trustee

Rosemary Martin 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’s 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 EY 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 Ltd Remuneration Committee.



**Carol Sergeant CBE**  
Trustee

Carol holds non-executive positions on the boards of Danske Bank AS, TP ICAP plc and BNY Mellon SA/NV. She is also Chairman of the BSI Standards Strategy and Policy Committee, and a member of the Governing Council and Trustee of the Centre for the Study of Financial Innovation. She has previously been Managing Director on the board of the Financial Services Authority, Chairman of Public Concern at Work, 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.



**Andreas Sohmen-Pao**  
Trustee

Andreas is Chairman of BW Group, BW LPG Ltd, BW Offshore Ltd and the Singapore Maritime Foundation. He is also a non-executive director of Singapore National Parks Board and Singapore Symphony Orchestra. Mr Sohmen-Pao was previously CEO of BW Group. He has also served as a non-executive director of The Hongkong 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. He holds an MBA from Harvard Business School.



**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. He is Vice President of The Baltic Exchange Charitable Fund and is 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 IMIF. Lambros was appointed Senior Independent Trustee of the Lloyd’s Register Foundation on 29 September 2015 and chairs the Grants Committee.

**We're bringing our grant holders together into a Foundation community, sharing ideas and enabling an amplification factor of the funding we distribute.**

The Board is supported by three committees which have been delegated authority on certain matters (Audit, Risk and Investment, Grants, and Nominations).

**Trustee recruitment and training**

The Board and the Nominations Committee invest considerable time in identifying Trustees with appropriate skills who will benefit the Foundation. They are equally keen therefore that any new trustee is properly inducted on to the Board. All new Board members go through a structured period of training.

During their training the Chairman will talk to them about the history of the Foundation, its role in Society and the way the Board operates. The Secretary will provide a fuller briefing on the operations of the Foundation, its structure, its risks, its key documentation and will provide a general overview of Trustees' duties and responsibilities and charity law. The new Board members will also be encouraged to meet with the senior staff in the Trading Group so they understand that business, and can affect appropriate oversight.

During the financial year the Trustees undertook an internal evaluation of the skills composition and operational effectiveness of the Board which did not identify any significant shortcomings. In addition, the Trustees received refresher training on the roles and responsibilities of charity trustees delivered by an external provider.

The Foundation Chief Executive, Richard Clegg, is responsible to the Board for the operation of the Foundation.

**Organisational structure**

The Foundation has a total of 20 members of staff supported by a further five secondees from its trading subsidiary. A service level agreement exists between the Foundation and the Trading Group for the provision of specialist business support in areas including finance, HR, communications, legal and IT. The Foundation pays for these services at an agreed market rate.

**The Advisory Council**

The Advisory Council continues to assist the Foundation on delivering its charitable aims by providing independent expert advice, support and constructive challenge in areas including developing general strategy and plans, identifying new funding opportunities and emerging priorities, maximising impact plus suggesting other bodies with which to work. The Advisory Council meets twice a year.



**For details of the members of the Advisory Council see:**

[lrfoundation.org.uk/about-us/advisory-council](http://lrfoundation.org.uk/about-us/advisory-council)

**100A1 Ambassadors**

The Foundation launched an ambassador programme in early 2017, 100A1 Ambassador. As a global charity committed to enhancing the safety of life and property and advancing public education, the Foundation's aim through the ambassador programme is to build an international network of friends, stakeholders and beneficiaries who are willing to promote the mission of the Foundation and its causes.



**For details of the Foundation's 100A1 Ambassadors see:**

[lrfoundation.org.uk/about-us/100A1-ambassadors](http://lrfoundation.org.uk/about-us/100A1-ambassadors)

**360Giving**

We are committed to being as transparent as possible so the Foundation is pleased to be one of the growing number of significant UK grant-givers to share grants data through the 360Giving standard. 360Giving supports organisations to publish their grants data in an open, standardised way and helps people to understand and use the data in order to support decision-making and learning across the charitable giving sector.



**For more information see:**

[lrfoundation.org.uk/programmes/360giving-data](http://lrfoundation.org.uk/programmes/360giving-data)

**Total footprint of the Foundation's impact**

In 2017/18 we continued with our stated aim of having impact and excellence at the heart of our grant making activity through the continued implementation of our impact framework. We also introduced new methods of delivering on our strategy and mission, through innovative ways of working with our grant community and utilising expertise and opportunity from within our trading subsidiary, Lloyd's Register Group Ltd. Such mixed motive investment approaches have enabled us to partner with our own company and others in seeking to accelerate a variety of research outcomes into potentially impactful solutions for issues around global safety.

In expanding our pathway to impact, we are also adapting our approach to how we engage with our stakeholders, not only to ensure governance best practice is promoted and enacted, but also to work with our grant holders and bring them together into a Foundation community so they can share ideas and collaborate, and enabling an amplification factor of the funding we distribute. Indeed, in addition to striving to make a positive impact through our grant and direct charitable activity we also expect award holders to use their Foundation grant to leverage funding from others. In encouraging this 'multiplying effect' approach with grantees, the money available to their projects has often grown, and in some instances by upwards of 400%.

Our impact framework developed in 2017/18 has now been fully embedded into our grant contracts and we are already observing an improved flow of impact information that we receive from our funded programmes.

# A fifth year of milestones.

## 2017

### July.

- Foresight Review on the public understanding of risk published, kick-starting Asia-focused risk research and communication.

### September.

- New report on distributed ledger/ blockchain technology to improve safety published by the Foundation and Alan Turing Institute.



**Open House London 2017: the Foundation throws open the doors of the Heritage and Education Centre and historic building to the general public, attracting 2,378 visitors.**

### October.

- Exhibition of HELMEPA's 'Educational Community and Public Awareness Campaign on the Marine Environment, Shipping and Sciences' is inaugurated at the Cultural Centre of Marmari to raise marine environment awareness.
- World's first 3D bridge becomes a 'living laboratory' for research with a vast sensor network to be designed and installed by a team working in the Alan Turing Institute & Lloyd's Register data-centric engineering programme.
- Call for applications to the Foundation's Access to Research Infrastructure Scheme – established to help researcher study leading to improved safety of life and property.

### November.

- Joint Foundation and University of York £12m partnership programme announced, looking at the safety of robotics and autonomous systems (RAS).

### December.

- Call for applications to enable open access to the Heritage and Education Centre, set up to inspire the next generation into STEM related activities.



**Lloyd's Register Safety Accelerator launched – a global programme to accelerate safety innovation in industry.**

## 2018

### February.

- The Foundation announces the Foresight Review on food safety and calls for contributions from food safety experts worldwide.

### March.

- Calls for contributions to the Foundation's Foresight Review on ocean engineering to help identify challenges and solutions to shape the future use of our oceans.
- Partnership with BLOC launched to establish a maritime blockchain lab.

### April.

- Workshop with industry experts held in London with the aim of improving safety in two of the world's most dangerous industries, fishing and passenger ferries.



**The world's first 3D printed steel bridge reaches another milestone as it undergoes its first informal load tests.**

### May.

- The Foundation and HSE announce the 'Discovering Safety' programme, aimed at substantially improving health and safety and ultimately saving lives, particularly in poorer or developing nations.
- Foresight Review on global safety evidence launched, highlighting available safety data and how to make it fit for the future.
- The Lloyd's Register Safety Accelerator partners with Plug and Play.
- Foresight Review on design for safety published – exploring how a culture of design for safety can enhance safety in the world around us.

### June.

- The University of Hull, in collaboration with the Foundation and the Norwegian Museum of Cultural History, offers four full-time UK/ EU PhD Scholarships in the cultural and technical dimensions of 19th and 20th century shipping, fisheries and trade.
- Invitations for expressions of interest to determine the need for a programme or network with the primary aim of enhancing safe working in confined spaces.
- Insight Report on the global safety challenges in the fishing industry launched.
- Call for applications for the Access to Research Infrastructure Scheme.
- Lloyds Register Safety Accelerator launches a search for SafetyTech innovators, offering trail funding and partnerships with leading marine and energy experts.



Lloyd's Register  
Foundation

**Get in touch**

Please visit [www.lrfoundation.org.uk](http://www.lrfoundation.org.uk)  
for more information



Lloyd's Register Foundation  
71 Fenchurch Street  
London, EC3M 4BS, UK  
E [info@lrfoundation.org.uk](mailto:info@lrfoundation.org.uk)

Lloyd's Register Foundation is a registered  
charity (Reg. no. 1145988) and limited company  
(Reg. no. 7905861) registered in England and Wales,  
and owner of Lloyd's Register Group Limited.

Copyright © Lloyd's Register Foundation, 2018.

