



Lloyd's Register  
Foundation

# Foundation Review 2014





The Lloyd's Register Foundation is a charity helping to protect life and property and support education, engineering-related research and public engagement.

## We do this because... life matters

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Find out more at  
[www.lrfoundation.org.uk](http://www.lrfoundation.org.uk)



Find out more online



Case study

Big data: In the future, nano-sensors will constantly stream information on the performance of critical infrastructure around the world.

## At a glance

# Connecting science, safety and society

### Our vision

Our vision is 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.

### Life matters

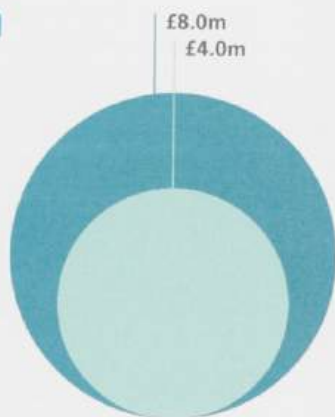
The Lloyd's Register Foundation is a charity, set up in 2012, which became fully operational in 2013. Our mission guides us to protect life and property through securing high technical standards of design, manufacture, construction, maintenance, operation and performance and to advance public education, in particular in transportation and other engineering and technology disciplines.

We draw on a long and distinguished history dating back to 1760 through our trading arm, Lloyd's Register Group Limited (LR), with its tradition of public benefit.

*Funding 61 programmes in 19 countries.*

### Foundation income by source 2013/14

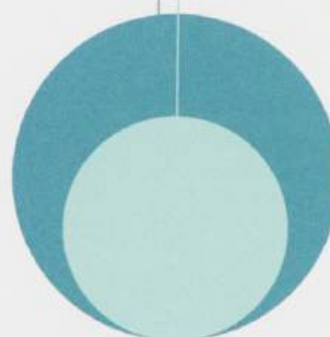
£12.0m



- Listed Investments
- Trading Group

### Value of grants awarded 2012/13 and 2013/14

£17.2m  
£8.1m

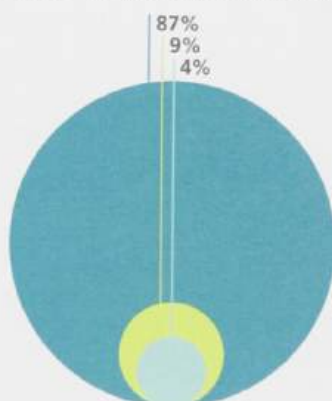


- 2013/14
- 2012/13

### Charitable expenditure by strategic theme 2013/14

£17.9m

£17.2 million of grants awarded and £0.7 million of direct costs. We have made a large research grant in the area of structural integrity which is serving to dominate the research element of our charitable expenditure in this chart. As our grants portfolio develops, we expect the portfolio balance to adjust accordingly. Scientific research will always dominate expenditure but not to the extent shown here.

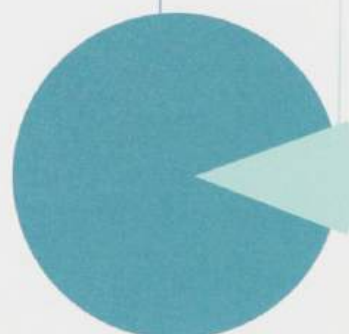


- Supporting excellent scientific research
- Advancement of skills and education
- Promoting safety and public understanding of risk

### Applications and grants 2013/14

119

15



- Approaches for funding
- Grants awarded



## Chairman's statement

# A year of change and development

The critical infrastructure on which modern society relies – ships, energy generation, industrial plant, railways – is under increasing pressure to satisfy growing demand while innovating safely and protecting lives and the environment. Societies and communities face major challenges linked to issues such as climate change, population growth, energy security, and the availability of food and water.

Technology, education and training need to advance rapidly to keep pace with these changes. With our mission to protect the safety of life and property and to advance public education, the Lloyd's Register Foundation has an important role to play in meeting these challenges.

### Our first full year of operation

The year has been one of considerable change and development for the Foundation. Having invested time and energy in putting in place a proper governance framework, including agreement on a long-term strategy, we have started to see the benefits during the year. The Managing Director's report will focus on the huge steps we have taken. However, I would like to highlight a few of these exciting initiatives.

For example, we have commissioned a number of technical review panels to look into key societal risk areas. The results of these will be made available to the public and over time we aim to produce a library of such publicly available material. We are working with potential beneficiaries in a number of areas on some new and exciting projects which will help establish us in our strategic sectors. We have also concluded an agreement to be one of the founding partners in the new Structural Integrity Research Centre being established by TWI (The UK Welding Institute) which will be a world-leading research centre.

One of the advantages we have is the ownership of a large risk-based engineering organisation, Lloyd's Register Group Limited (LR), which employs experts in a number of fields. This helps us to understand and address complex technical issues while also helping to deliver our public benefit agenda. This unique relationship helps to define the Foundation. In reality, the

*"As a charity, the unique relationship between the Foundation and our trading arm, Lloyd's Register Group Limited, means we can focus our resources on ways to fulfil our mission rather than having also to raise funds."*



Foundation is a small charity which provides grants and other funding to advance safety and public education. The ownership of a large trading organisation, which part funds the Foundation through its trading profits, means we do not have to commit increasing resources to fundraising, as other charities are having to do, but instead we can focus on developing our plans without concerns as to whether we will have sufficient funds available.

There is considerable advantage to this type of relationship. In addition, LR's services directly support a significant part of the Foundation's charitable objectives – to enhance the safety of life, property and the environment – by helping its clients to ensure the quality construction and operation of critical infrastructure.

To ensure that the Foundation understands and can help direct the trading entity, two of the Foundation trustees serve on the board of LR. It is not surprising that the aims of the Foundation and its trading company are heavily aligned.

#### **Supporting the Foundation**

We are fortunate to have a full complement of highly experienced and committed people as trustees, who freely give of their time in order to direct and govern the Foundation. I am very pleased to see how the boards of the Foundation and LR are enthusiastically engaged in our activities.

As Chairman, I offer sincere thanks and appreciation to my fellow trustees for everything we have already achieved and continue to achieve.

I would like to formally welcome Sir Brian Bender and Carol Sergeant who joined the Board during the year and who bring with them considerable skills and knowledge which will further help to develop the Foundation. We are also pleased that Rosemary Martin joined the Board on 1 July 2014, and we look forward to the significant contribution we know she will make.

I should also like to thank Christine Dandridge and Jan Kopernicki who stood down as trustees during the year, and Michael Lykiardopulo who moved across to join the board of LR. Christine, Michael and Jan were part of the board which helped formulate the plans for the establishment of the Foundation and then, along with the other trustees, helped oversee its initial growth. We owe them a debt of gratitude for helping to establish such strong roots.

The trustees would like to extend their thanks to Richard Sadler, LR's Chief Executive Officer, for his firm leadership of the trading company during continued difficult economic times, to the board and management of LR and to all of its employees worldwide. The trustees would also like to thank their Secretary, Keith Povey, who helped manage the mechanics of establishing the Foundation and putting solid, best practice governance in place, and Lambros Varnavides who has helped establish and now chairs the Board's Grants Committee.

In October 2013, we were very pleased to be joined by Professor Richard Clegg as the Foundation Managing Director. Richard has been with Lloyd's Register since 2010 and brings an array of experience from the nuclear sector and from working in industry, academia and government in both the civil and defence sectors. Richard has brought a focus and helped define the direction the Foundation wishes to follow. The Board would like to thank him for his strong leadership and support. Until October, Alastair Marsh held the position of Interim Managing Director, and thanks go to him also for his efforts and assistance.

*"Everyone who works for the Foundation or for LR ultimately helps to make the world a safer and better informed place in which to live."*

As I noted at the start of my statement, the world continues to evolve. Lloyd's Register as an entity has been helping society since 1760, albeit it has had to change its organisational structure a number of times as the demands of society have developed, and laws and expectations have changed. The Lloyd's Register Foundation, with its 100% ownership of a large trading entity, is the latest iteration in this long and distinguished history and one which we believe will allow us to meet the current challenges of society in the best way possible.

Everyone who works for the Foundation or for LR ultimately helps to make the world a safer and better informed place in which to live. For over 250 years we have made a difference to people's lives and, with such an excellent team supporting the Foundation, I am confident that we will continue to do so in 2014/15 and beyond.

#### **Thomas Thune Andersen**

Chairman, Lloyd's Register Foundation and  
Chairman, Lloyd's Register Group Limited



## Managing Director's review

# Progress on strategy and development of the grants portfolio



*"Through our grant making we aim to connect science, safety and society by supporting research of the highest quality and promoting skills and education."*

This is my first annual review statement as MD of the Lloyd's Register Foundation and I feel that we have a lot of exciting progress to report. I would like to highlight the charitable activities of the Foundation and the strides we have taken in setting our strategy and beginning to build our grants portfolio.

June 2014 was a landmark for the Foundation when we published our six-year strategy. This contains the 'golden thread' of how our charitable aims will be delivered through four strategic themes and their associated objectives and funding priorities.

Our strategic themes are concerned with supporting excellent scientific research, promoting engineering-related education, encouraging public communication around risk, and facilitating the uptake and application of technology for the wider benefit of society.

Our mission is concerned with enhancing the safety of life and property linked to the critical infrastructure on which modern society relies, particularly in the energy and transportation sectors. Our focus on safety relates to society as a whole but in areas which may be hidden from view – lives and livelihoods depend on quality systems you will probably never see, ships, roads and rail tracks on which you may never travel and distant production plants about which you have never heard. The Foundation's role together with Lloyd's Register Group Limited (LR), our trading arm, is to make the world a safer place by supporting engineering-related research, training and education targeted at these areas of critical infrastructure.

### A good start

We are proud that in 2013/14 a good start has been made with implementing the strategy and beginning to strengthen our grants portfolio, which will continue to grow next year. With our grants we aim to take the long view, clustering our support and building long-term relationships with those we work with. Our guiding principle is impact and excellence through supporting the best research and education teams worldwide and working with them to maximise the impact of their results for the wider benefit of modern society. We also want to make a distinctive difference, so we search for and invest in 'white space' research topics for which there is currently little or no funding available, and where the Foundation can make a real impact.

There have been specific highlights in 2013/14 that we are proud to report and that are early indicators of the new direction in which the Foundation is heading. We signed a heads of agreement with TWI in the UK to establish a new postgraduate research centre connected with one of our funding priorities in the area of structural integrity and systems performance. Working with TWI and other stakeholders, we aim to put the new centre at the hub of an international research network in the field.

Another highlight to report, linked to our strategic theme of training and education, is the award of a sizeable grant to establish an innovative apprenticeship scheme in the marine sector. This tackles some of the structural issues previously inhibiting small to medium-sized companies training apprentices.

One of the strategic themes of the Foundation is concerned with emerging technologies. We believe it is important to look 'over the horizon' at new areas of science and technology, the applications of which could offer major safety benefits. Under this theme, we have commissioned international reviews in the areas of nanotechnology and big data which we will use to inform our future research plans.

Overall, 2013/14 has been a solid year in laying the foundations on which to build. In the coming years, the activities of the Foundation will be growing significantly to achieve our aim to become one of the world's leading engineering research and education charities.

Our work is made possible by the hard work and success of the Foundation's trading company, LR, by the support of the Foundation's trustees and our small team of staff. We have many stakeholders in science, industry, academia, the third sector and the policy community, and we look forward to working with them all as we strive to help make the world a safer place.

### Professor Richard Clegg

Managing Director of the  
Lloyd's Register Foundation

## Highlights 2013/14

The highlights from our first full year of operation illustrate the progress we have made in our ambition to become one of the world's leading engineering research and education charities. The stage is now set for further advancement in 2014/15.

- First full year of operation as Lloyd's Register Foundation
- Appointment of Managing Director to put strategy in to practice
- Development and publication of Strategy 2014–2020
- Commenced major grant giving in key research and education areas under our strategy
- Dialogue with our stakeholders and research community about the 'white space' where we can target our funds and achieve a real impact
- Research collegium tackled global coastal eco-cities challenge
- First international foresight review exercise on nanotechnology completed and published
- Forum on big data launched as second foresight exercise
- Launch of first international research colloquium

## Mission, vision, strategy

In 2014, we published our strategy which sets out how we will achieve our vision

### 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

Our vision is 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.

### Strategic themes:

#### 1 Supporting excellent scientific research

#### 2 Accelerating the application of research

#### 3 Promoting safety and public understanding of risk

#### 4 Promoting advancement of skills and education

### Objectives:

- |   |  |  |  |
|---|--|--|--|
| <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> |
|---|--|--|--|

### Funding priorities:

- |  |  |  |
|--|--|--|
| <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 Lloyd's Register Foundation Information 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:

- |  |   |   |   |
|--|---|---|---|
| <ul style="list-style-type: none"><li>• Aerospace</li><li>• Automotive</li><li>• Built environment</li></ul> | <ul style="list-style-type: none"><li>• Food</li><li>• Healthcare and medical</li><li>• IT and communications</li></ul> | <ul style="list-style-type: none"><li>• Manufacturing</li><li>• Marine</li><li>• Oil and gas downstream</li></ul> | <ul style="list-style-type: none"><li>• Oil and gas upstream</li><li>• Power and utilities</li><li>• Rail and metro</li></ul> |
|--|---|---|---|



## Strategy into practice

# Objectives, achievements and future plans

We aim to set the agenda in the fields in which we work and for our results to lead to enhancements in safety with maximum benefit for modern society. In light of this, we set the following main objectives for 2013/14:

- appoint a full-time head of the Foundation to give strategic and operational leadership
- develop and launch a new strategy
- realign our historical grants portfolio with the new strategy and objectives
- revise our procedures and guidance notes for grant applications
- commence major grant giving in key research and education areas.

Following the appointment of a managing director in October 2013, the development of our new strategy gained impetus. After a lengthy review of our activities and aims, one of the key conclusions was to develop new interests and focus our resources in four strategic themes.

### Our strategy

In June 2014, we published our strategy which sets out how we will achieve our vision. It focuses on key objectives under the four strategic themes: promoting safety and public understanding of risk; advancement of skills and education; supporting excellent scientific research; and accelerating the application of research.

We aim to work proactively with the research and education communities we support, as well as other funding bodies, agencies and learned societies, in the UK and internationally, to leverage our grants and maximise their impact for wider society. We will work in co-ordination and consultation with others to enable us to target our support at the key areas where we can make a distinct and recognised contribution in pursuit of our charitable aims.

We will cluster grants and build long-term relationships with the funded research and education communities. Working with the researchers and projects we support, we can identify how our work will benefit society, who the beneficiaries will be, and the pathway to impact.

The Foundation's strategy map (opposite page) encapsulates the approach we are taking. It depicts the objectives and how we achieve them through our funding priorities. It also lists the sectors of relevance to the Foundation where we aim to make a public benefit.

### Our work in 2013/14

After publishing our strategy and developing a communication plan for its dissemination to key stakeholders, this left a small remainder of the financial year for implementation. But nonetheless we have made significant progress, not just in terms of grant giving but in our other activities as well.

In 2013, the Foundation took over responsibility for a number of programmes from the Lloyd's Register Educational Trust (LRET). We have aligned most of these with our strategic themes but some no longer have a good fit with the Foundation's new strategic direction. We will continue to honour those commitments until their conclusion.

We have produced a new suite of guidance documents on our web site to aid grant applicants. This included the publication of our intellectual property policy aimed at establishing the right environment to protect and exploit intellectual property arising from Foundation-funded research, in order to maximise its benefit for wider society.

In 2013/14, we set up two international expert panel groups to review the areas of nanotechnology and big data, under our emerging technologies funding priority, looking at areas where the Foundation could invest in targeted research. The first of these, on nanotechnology, completed a report launched in July 2014 and is covered in more detail on page 13.

We have commenced major grant giving in key research and education areas under our strategy with the launch of our first major grant under the structural integrity and systems performance funding priority and of a new grant to support an innovative apprenticeship training scheme in the marine sector. You can read about these projects on pages 20 to 23.

We are developing our process for monitoring and tracking the outcomes arising from our support in order to be able to demonstrate that our grants represent value for money, are achieving their charitable objectives, and are delivering benefit to wider society. It also serves as an important evidence base to inform future strategy. We do not proscribe hard metrics but we do work closely with those we fund, at the early stages of awarding grants, to identify what the targeted outcomes are and how they will be monitored and tracked. In the next year, we will be refining how we measure the impact of our activities and collecting performance data. Even so, there are areas where we can demonstrate measurable impact as illustrated in the following pages about each strategic theme.

*"During the year, we have achieved significant progress against our main objectives."*

### Future plans

We can highlight some general areas which we plan to advance over the next year:

- developing our process for monitoring and tracking the outcomes arising from our support
- progress grant giving across all our funding priorities in our four strategic themes
- continue to build relationships with other funding bodies and stakeholders.

In the following sections, we summarise our achievements, impact and future ambitions against our four strategic themes.



## Strategic theme 1

# Supporting excellent scientific research

### Objectives

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

### A model for future funding

#### The UK's first postgraduate education and research centre in structural integrity

In June 2014, the Foundation reached agreement with TWI to provide £15 million research funding to establish the new National Structural Integrity Research Centre (NSIRC) in Cambridge, UK. This funding arrangement provides a model for future investments; it is an example of a major centre of excellence being established through co-funding from industry and academia – and now the Foundation. The TWI is one of the world's foremost independent research and technology organisations, with expertise in solving problems in all aspects of manufacturing, fabrication and whole-life integrity management technologies.

The Foundation will become a founder sponsor and council member of the newly-established Structural Integrity Research Foundation (SIRF), which is responsible for the governance of NSIRC.

Our collaboration with SIRF will work over 10 years. It will inspire and engage the next generation of marine, energy and transportation engineers by providing fundamental science and industry-driven research opportunities aligned with a postgraduate education programme.

Our funding will create up to 83 PhD and EngD studentships. The research will support our objectives by focusing on improving the safety of the critical infrastructure that modern society relies on, particularly in the energy, marine and transportation sectors.

Research undertaken by the Foundation's students into different areas of structural integrity and new areas of technology will progress by working towards recognised postgraduate degree qualifications through NSIRC's established relationships with leading universities in the UK and overseas.



A number of the Lloyd's Register group companies are already industrial members of TWI, and through this investment the Lloyd's Register Foundation will strengthen links with the world-class pool of engineering knowledge and knowhow. It will contribute to the direction of SIRF activities, including the unique education hub of NSIRC with its purpose-built facilities and equipment.

*"We are delighted to be working with the Lloyd's Register Foundation in this venture and are confident that strong industry partnerships are key to effective education programmes. The collaboration will promote greater understanding of future technical needs as well as safer, and increasingly efficient, practice in the field of structural engineering."*

**Christoph Wiesner**  
Chief Executive at TWI



To find out more about the NSIRC visit [www.nsirc.co.uk](http://www.nsirc.co.uk)







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## Activities and impact

We have made the following progress towards achieving our objectives and furthering our charitable activities.

- We continued funding of 20 programmes around the world covering a wide range of subjects including: transport risk management, water security, nuclear decommissioning, and offshore engineering and geotechnics. This included support for 40 centres of excellence.
- As highlighted on the previous page, we have agreed the first major grant under our strategy, signing a heads of agreement with TWI to become a founding sponsor for establishment of the new NSIRC. This marks a significant step in the delivery of our new funding strategy as it is co-funding to provide financial sustainability and gearing and a contribution to the growth of a centre of excellence.



- During the year, we established an international expert advisory panel on the topic of nanotechnology with extensive experience at both the scientific, safety and regulatory levels. The resulting report, launched in 2014, is a foresight exercise to look at the worldwide developments being made in nanotechnology and what the impact of its applications might be in the engineering-related sectors of relevance to the Lloyd's Register Foundation. In this way, the report straddles two of our strategic themes, supporting excellent scientific research and accelerating the application of research. More detail about this report and its findings are on page 13.

**40**  
centres

In 2013/14, our funding of 20 research programmes around the world included support for 40 centres of excellence.

- Work also began on a similar exercise on the subject of 'Big data: data-centric engineering' with an industry forum held in March 2014. This drew together leading names in the research field to debate the impact of big data on society and the way in which we all conduct our business safely, securely and reliably. The forum, led by Professor Richard Clegg, the Foundation's MD, and Sir Mark Walport, the UK's Government Chief Scientific Adviser, reviewed the challenges and opportunities created by big data. We also commissioned an international academic expert panel chaired by Professor Sir Nigel Shadbolt of Southampton University, to provide a detailed assessment of technology trends in the field of big data and the impact these are having on society. The report will be published at the end of 2014.



*Optimising our global network of researchers, recognising talent and celebrating success.*





To find out more about our current research programmes see [www.lrfoundation.org.uk/programmes](http://www.lrfoundation.org.uk/programmes)

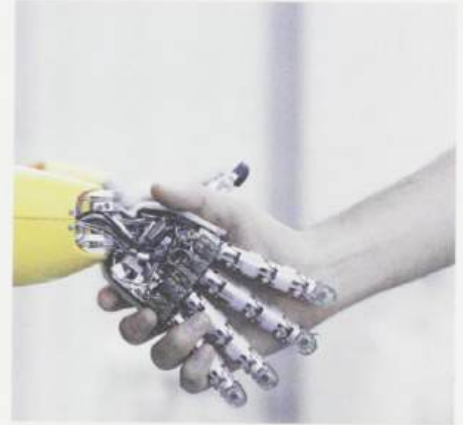
- The third and last of our research collegia was held in July to September 2013 in the UK. These events brought together academia and industry from around the world with the aim of fostering the participants' skills and abilities and developing a professional network of young scholars, while also helping to tackle a topical environmental issue. The theme for 2013 was coastal ecocities. The research papers from the three events are available on the University of Southampton's web site.
- In February 2014, we announced that we would be hosting an international research colloquium, held in September 2014, to showcase the impact and excellence of the work funded by the Foundation, and also to help in communicating our strategy. The event brought together the international communities we sponsor. It served as a forum for sharing technical knowledge, a platform for some of our researchers to communicate the quality and impact of their work on society, and a means to engage younger researchers.



## Future plans

Next year will be the first full year under our new strategy. In light of this, we plan to focus our activities on:

- continuing the realignment of our historical grants portfolio with the strategy
- working closely with TWI on commencing research activities in NSIRC, involving our first sponsored postgraduate student intake
- exploring and funding international research links with other centres of excellence around the world that complement the programme in NSIRC, following a 'hub and spokes' type model with NSIRC at the hub
- commencing independent technical reviews in the other funding priority areas of resilience engineering and human and social factors; we will use the results from these reviews to design and target our future grant giving in these areas
- building on the results of our expert panel reviews into nanotechnology and big data, with the launch of ITTs (invitations to tender) to set up research networks in these areas aimed at the Foundation's challenges
- continuing to promote technology foresight into emerging technology areas relevant to the Foundation's aims; candidate areas include space technology and artificial intelligence and advanced robotics
- building and strengthening relationships with other research-funding bodies and learned societies that share our aims in engineering-related subjects; also learning from these organisations, as well as from other charities that have similarities to us, to continually improve and enhance our own activities and maximise our impact.



**22**  
countries

The 2013 research collegium drew together 24 postgraduates representing 22 countries to develop imaginative solutions to the problems faced as the world's population concentrates near the coast.







Nano flower bouquet: three-dimensional nanostructure grown by controlled nucleation of silicon carbide nanowires  
Image courtesy of the Nanoscience Centre, University of Cambridge



## Strategic theme 2

# Accelerating the application of research

### Objectives

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

### Foresight review of nanotechnology

#### The next industrial revolution

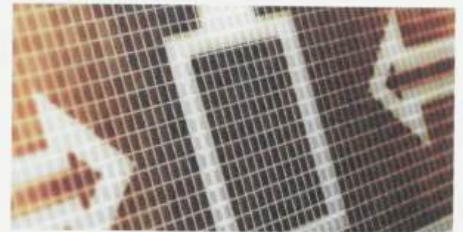
In October 2013, we assembled an expert panel to consider nanotechnology. The panel included top academics from world-leading institutions: the universities of Cambridge, Heriot-Watt and Southampton and the Health Safety Laboratory in the UK; Yale in the USA; the National University of Singapore and the University of Münster in Germany.

The resulting report aims to try to look into the future at what potential impacts developments in nanotechnology might have on the safety and performance of engineering assets and the infrastructure on which modern society relies. It outlines a number of areas in which the Foundation could usefully contribute to the development of the technology while fulfilling its mandate of delivering public benefit.

Results included suggestions for research into nano-sensors, which can be incorporated into buildings and assets thus enabling them to 'talk' – providing feedback on corrosion or stresses.

Research into energy storage was another theme – megawatt batteries that could deliver profoundly different transportation systems or enable white goods to be powered for life at point of purchase. The Foundation could assist the development of new engineering materials and manufacturing techniques that could see ships being glued together from lightweight composites. Or fund research into methods for assessing the quality of nanoparticles delivered to companies in future supply chains.

Based on its findings, the Foundation is looking to identify the gaps or 'white space' in nanotechnology research where it could make a distinctive contribution, which would lead to enhancements in safety. This would be through accelerating targeted technology applications or contributing to the body of knowledge addressing any uncertainties about potential risks to human health, property or the environment.



*"It is convergence of the sciences spanning chemistry, physics, materials science, biology and computational sciences that is making nanotechnology possible. Its applications will impact almost every industry including energy, transportation, manufacturing, medical, computing and telecommunications."*

#### Professor Sir Mark Welland

Director of the Nanoscience Centre  
University of Cambridge and Chair  
of the nanotechnology expert panel



Find out more about the report  
at [www.lfFoundation.org.uk/2014](http://www.lfFoundation.org.uk/2014)

## Activities and impact

Under this strategic theme our driver is to maximise the uptake and application of the fundamental research we are engaged in. This is one way of providing the practical evidence that we are delivering clear benefits to society and achieving our objectives. Our aims are to enhance safety benefits rather than any requirement to generate a financial return, enabling us to focus on the most promising opportunities for the wider benefit of society. However, if a suitable opportunity arises to benefit from the commercialisation of intellectual property, we may pursue this if the proceeds enable us to fund further research for greater public benefit.

# 2 x 2

Our foresight reviews, which so far have looked at nanotechnology and big data, cross two of our strategic themes – supporting excellent scientific research and accelerating the application of research.



This is a new strategic theme and progress is just beginning on its design and implementation. There have been, however, some notable achievements against our objectives.

- Some of our funded centres are actively engaged in contributing to international standards. For example, Professor Yoo Sang Choo at the Centre for Offshore Research and Engineering at the National University of Singapore actively contributes to the ISO/TC 67/SC7 Offshore Structures Committee. He serves on ISO/TC 67/SC 7/WG 3 technical panels in substructure and assessment, and inspection, in preparation of the second edition of ISO 19902 Petroleum and natural gas industries – Fixed steel offshore structures. He is also a working group member in the development of the new OGP-ISO 19901-9 Structural integrity management of offshore structures.

- Research on safety management in offshore helicopter transportation has created much interest in the industry. The research was by Dr Felipe Augusto Coutinho Nascimento, of the Lloyd's Register Foundation Transport Risk Management Centre at Imperial College London. He focused on the mechanisms of hazard identification and risk analysis embedded in safety management processes and a possible suite of novel processes for enhanced hazard identification/risk analysis. The researcher has been invited to peer-review the latest offshore helicopter safety study commissioned by the UK Civil Aviation Authority, which exploited elements of his thesis' processes and is proposing to change the industry dramatically. The processes are designed to be transferable to other safety-critical industrial activities, and therefore can help improve safety in other sectors.

# 20 million

passengers

Offshore helicopter transportation each year:

- 50+ countries
- 8,000 installations
- 20 million passengers
- 6 million flights





### Intellectual property: a valuable asset for the benefit of society

Through its charitable funding activities, the Foundation supports leading-edge scientific research from which useful results will be created. This intellectual property (IP) is a valuable asset and consequently the Foundation has an obligation to ensure that it is suitably protected and applied for the public good.

We also recognise that the appropriate protection and use of IP is an important factor in creating the best conditions for research to flourish and in translating useful research results into tangible public benefits. In view of its responsibilities, in 2014 the Foundation established and published its policy on intellectual property rights connected with the work it funds. Its purpose is to give clear, transparent guidance to our grant recipients, in the spirit of true collaboration, to promote the uptake and application of technology and knowledge for the ultimate benefit of society.

The uptake and application of technology is a key driver for the Foundation, and is one of our high-level strategic themes. To maximise its impact and public benefit, in subsequent years the Foundation will be working proactively with the research community to exploit the useful results arising from the work it funds. Our IP policy has been published and is openly available on our web site.



To find out more about our current programmes accelerating the application of research see [www.lrfoundation.org.uk/programmes](http://www.lrfoundation.org.uk/programmes)

### Future plans

Next year will be the first full year under our new strategy. In light of this, we plan to focus our activities on:

- continuing realignment of our historical grants portfolio with the strategy priorities
- promoting with our research communities the importance of translating the results from Foundation-sponsored work into tangible benefits, including the uptake of scientific knowledge to underpin international safety-related codes and standards
- identifying opportunities from Foundation-sponsored work to make further investments in technology development, in co-ordination with other funding partners, to translate ideas into applications. Our aim here is to support and de-risk the follow-on development of new technology applications to higher-TRLs (technology readiness levels), resulting in an ultimate safety benefit for society in line with our charitable objects.

*Facilitating breakthrough technologies to enhance safety.*

## Strategic theme 3

# Promoting safety and public understanding of risk

## Objectives

- 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

## A memory bank for the future

### Information Centre and library

The Lloyd's Register Foundation Information Centre (IC) is instrumental in the achievement of our objective of maintaining and promoting a memory bank of safety and risk management developments. The IC aims to:

- advance public education within the transportation industries and any other related engineering and technological disciplines by offering library, archive and research resources to the public; and
- enhance public understanding in these areas, encourage and support current research and assist with research concerning the history and development of Lloyd's Register.

The IC is the custodian of the Lloyd's Register Foundation library and archive. This unique resource is made freely available for education and research purposes worldwide. The IC is responsible for over 80,000 items and we are committed to maintaining and any promoting it as a unique resource of current and historical information concerning maritime history, engineering science, naval architecture, offshore engineering and ocean technology, available to all researchers.

In August 2013, the IC provided a new home for much of the Denny Library collection of the Royal Institution of Naval Architects (RINA). RINA relocated its headquarters in London and, while it took some of its own archival material and reference books, it did not have space for all of its collections which would otherwise have been broken up or destroyed.

RINA is an internationally renowned professional institution whose members are widely represented in industry, universities, colleges and maritime organisations in over 90 countries. The Institution was founded in 1860 and its library collection included bound volumes covering all aspects of design, construction, maintenance and operation of commercial and naval vessels. In addition, the Denny Library held a wide



range of other relevant technical publications, including copies of all technical papers published by RINA, together with those of other organisations.

By taking on some of the RINA library, the IC was able to strengthen its holdings and journal runs and ensure that this historical collection is kept available for researchers, students, clients, staff and the wider public. Work to add provisional details of the collection to the IC library catalogue was completed in April 2014.

Through visits, presentations and tours, the IC encourages interest in Lloyd's Register's heritage, present and future work, and how we work together for a safer world. As one example, in July 2014, the IC hosted a visit of the University of Cadiz during which we encouraged and informed students to learn more about classification and risk, as well as educating them on the history and development of Lloyd's Register and the work of the Lloyd's Register Foundation.



To find out more visit  
[www.lrfoundation.org.uk/public\\_education](http://www.lrfoundation.org.uk/public_education)





THE ARCHITECTURAL DRAWING



CROSS SECTION

SECTION  
AND  
Description  
30  
6"  
ATTACH

## Activities and impact

To arrive at this new strategic theme, we have widened a previous programme area, safety of life, to include the public understanding of risk. Our motivation for this is to build trust through dissemination of the results of our work and provide independent technical commentary to inform a balanced debate in society.

Against the objectives of this theme, we have made the following progress.

- We continued to fund four of our existing programmes: CHIRP Maritime, UK; Foundation for Science & Technology, UK; Nautical Institute, UK; and Royal National Lifeboat Institution, UK.



- We published our nanotechnology foresight review report and made it freely available on our web site. This is the first in our report series aiming to openly disseminate information about the work we support. It is hoped that these reports will provide insights for the research community and also inform a wider debate in society about the engineering safety-related challenges being investigated by the Foundation.
- Eight public lectures were held by our funded programmes, including talks on delivering Europe's largest infrastructure project by Andrew Wolstenholme, CEO, Crossrail; safety and reliability engineering by Professor Donald Winter, University of Michigan; and geotechnical solutions for the offshore, interweaving of research and practice, by Dr Suzanne Lacasse, Technical Director of the Norwegian Geotechnical Institute.
- As well as publishing some 235 academic papers, books and chapters during the year, our research partners took part in conferences, workshops and seminars and their findings are published in conference proceedings.
- As part of its work, the Lloyd's Register Foundation IC helped 11,710 enquirers (on matters ranging from conducting research to tours of the building), organised 28 seminars and catalogued 931 library items.
- The IC commenced a programme to digitise key examples of unique historical material and place them on our web site for open, free use for scholars and public.

**235**  
publications

Our research partners published some 235 academic papers, books and chapters during the year, took part in conferences, workshops and seminars and their findings are published in conference proceedings.



*Making a distinctive impact on enhancing safety of critical infrastructure.*





In addition, the daily work of LR is a major contributor to the first of our objectives: promoting the safety of life and property. LR is a global engineering, technical and business services organisation, providing independent assurance and expert advice to help ensure that its clients' assets and processes are safe, responsible and sustainable. LR's highlights in the year related to this objective include:

- achieving top ranking as the 'best performing' recognised organisation in the Paris Memorandum of Understanding table of port state control performance, reflecting LR's drive to help improve safety in shipping
- launch of the new LR Rules for Offshore Units in one single document including several new topics such as cryogenic spill and floating liquefied natural gas offloading
- appointment as independent safety assessor for Beijing Metro's Yan Fang Line, the first driverless line in China with all sub-systems developed and supplied by a domestic manufacturer
- successful delivery by LRQA of a verified carbon standard contract to the International Development Enterprises India. The installation of low cost irrigation devices saved almost 33,000 tonnes of CO<sub>2</sub> in its first year.

# +60,000

LR helps over 60,000 clients to improve the safety, quality and performance of their business.

## Future plans

Next year will be the first full year under the new strategy and we will look to strengthen activities in this theme. Specifically, we will aim to:

- promote open publication and access of results and data from the work we fund for public benefit
- grow the activities of our Information Centre and offer internships
- undertake a review of the issues and barriers connected with the communication and public understanding of matters relating to risk in order to identify the 'white space' areas where the Foundation can make a distinctive contribution in this area
- continue to work with our trading arm, LR, and working through it to help deliver our charitable aims linked to enhancing the safety of life and property.



To find out more about our current programmes under this theme see [www.lrfoundation.org.uk/programmes](http://www.lrfoundation.org.uk/programmes)



## Understanding the human element

The Foundation funds The Nautical Institute (NI) to deliver a joint human element project to raise awareness of the human element in shipping and its practical application to improve conditions and safety for seafarers. The project produces the international maritime human element bulletin *Alert!*, distributing 55,000 copies through international maritime training and professional organisations worldwide, and to over 3,000 individual subscribers. The project has also developed a popular web-based library of information on the human element and how to address it.

Each issue of the bulletin tackles a different theme, for example living conditions at sea, regulations and changing expectations (issue 34), physical ergonomics and workstation design (issue 36), or escape, emergency conditions and security (issue 37). The latest fourth series, which focuses on 'solutions', has had very good feedback from around the world. Lloyd's Register welcomed issues 35 and 36 that drew attention to the importance of taking a human-centred approach in ship design.

Our partnership with the NI stretches back to 2006. We are now in the fourth series of *Alert!* and issue 39 will be the final one. Bulletins are available on the *Alert!* web site, along with short instructive videos corresponding to the first 21 issues and funded at an earlier phase in our collaboration, and a large library of human element information. Together, we will address management of this legacy as this successful partnership comes to a close in 2015.



To find out more visit [www.he-alert.org](http://www.he-alert.org)

## Strategic theme 4

# Promoting advancement of skills and education

### Objectives

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

### Shipbuilding skills for the future

#### Sustainable model for apprenticeship schemes

There is an acknowledged skills gap in the UK and apprenticeship schemes are one means to address this problem. The recruitment of apprentices can be of enormous benefit to employers, bringing renewed enthusiasm and a growing skilled labour force trained to their specific needs.

The Foundation has agreed to grant almost £600,000 over a three-year period to develop a novel apprenticeship loan scheme and help continue an existing bursary scheme for small and medium enterprises (SMEs) in the UK's marine sector. The grant is to the Worshipful Company of Shipwrights Ark Appeal; the company is committed to promoting the growth of marine apprenticeships to sustain the level of competency in traditional marine skills through the generations.

The bursaries and loans underwrite the first year wages of a four-year higher apprenticeship. The first year of an apprenticeship is cash negative for a business and therefore the funding overcomes the largest hurdle SMEs in particular face when taking on young people. Furthermore, help is provided with the interview process, wage rates, and contractual, administration and mentoring processes, so that by the end of the first year real benefits are seen by the company.

Bursaries are offered as an incentive for SMEs new to apprenticeships, whereas the loans are for those who have benefited from the bursary scheme but need further help and encouragement to take on more apprentices.

Loans are to be paid back to the Ark Appeal over years three and four of the apprenticeships. In this way, the funds provided by the Foundation can be redeployed time and time again so the programme will become sustainable without further funding from us. There is the potential to apply this original sustainable loan scheme model to other sectors in the Foundation's remit.



Berthon Boating Co. Ltd. started the existing successful bursary scheme in 2009. It has seen over 165 apprentices hired and graduation rates in excess of 90% (compared with the 75% national average). Two years ago, the Ark Appeal undertook to fund the scheme. Berthon has continued to be involved with advice and other non-financial support to the participating companies and the British Marine Federation accommodates a separately-funded administrator.

Our funding is helping to escalate the growth in apprenticeships in the marine sector. As a result, the sector will have individuals equipped with the right skills and young people will have appropriate training for local work. The benefit both to the individuals and to industry will be long term and, as the scheme progresses, it will gain momentum and hopefully be successful in attracting funding from other sources.



To find out more visit [www.shipwrights.co.uk](http://www.shipwrights.co.uk)







## Activities and impact

We are committed to widening access and bringing engineering-related skills and education to previously disadvantaged or under-represented groups and communities and inspiring the next generation of engineers.

Against our objectives we have made the following progress.

- We continued funding 37 programmes around the world covering a wide range of activities including: developing and delivering a Masters programme in rail safety to be taught at Zhejiang University, China; and supporting The Engineering Link Group to expand into other parts of Australia, a scheme bringing industry and academia together with school students and teachers to promote and develop engineering skills and careers.
- Seven new grants were awarded during the year related to our new objectives:

### Inspiring the next generation

- Arkwright Scholarships Trust, UK: Supporting six scholars who are passionate about engineering through their sixth form studies, and supporting the Trust in widening participation. Grant of £40,000; support scheduled to end June 2017.



- National Space Centre, UK: Doubling numbers of 'lead educators' who improve the teaching of physics and mathematics, and expanding the scheme into Wales, Scotland and Northern Ireland. Grant of £198,000; support scheduled to end June 2016.
- Smallpeice Trust, UK: Annual residential courses in marine technology at the universities of Strathclyde, Newcastle and Portsmouth. Grant of £430,914; support scheduled to end June 2018.
- Young Engineers, UK: Activities to inspire young people to become engineers, including after-school clubs and engagement with industry. Grant of £170,000; support scheduled to end June 2015.

## Enhancing the knowledge and skills of the workforce

- Worshipful Company of Shipwrights, UK: Bursaries and loans to encourage marine SMEs to take on apprentices. Grant of almost £600,000; support scheduled to end in September 2017.

## Widening access and enhancing the knowledge and skills of the workforce

- International Maritime Law Institute, Malta: Scholarships for three Masters students each year, usually from countries with low GDP, studying for one year in Malta, to improve practical knowledge and skill in interpreting and drafting IMO (International Maritime Organization) legislation. Grant of £230,571; support scheduled to end June 2017.
- UK NEST, UK: Six scholarships each year for engineering undergraduates who show interest in working for members of UK NEST. Grant of £96,000; support scheduled to end June 2016.

**37**

programmes

In 2013/14, we funded 37 advancement of skills and education programmes around the world.

*Raising interest and generating enthusiasm around engineering.*





To find out more about our current advancement of skills and education programmes see [www.lrfoundation.org.uk/programmes](http://www.lrfoundation.org.uk/programmes)



We made seven one-off small donations (under £25,000). The largest of these was made to the Smallpeice Trust for a new Girls into Engineering residential course at the University of Bristol, which supports our objective to widen access. Other donations were made to: IMarEST European International Submarine Races; Royal Institution of Naval Architects, UK, to enable 20 postgraduate students to attend the conferences each year, over three years; SET Awards, UK for the Maritime Technology Student of the Year Award 2014; Warwick Engineering Society, UK, to support the conference organised by the Society for university and selected school students; Leamington School, UK, to support the Whittle Wonders, its national winning team of F1 in Schools, in its participation in the world finals in Dubai in 2014; and to Children's Radio, UK.

## Future plans

Next year will be the first full year under the new strategy and we will look to strengthen activities in this theme. Specifically, we will aim to:

- undertake a review of the current UK provision of schemes promoting the advancement of skills and education related to engineering and safety in order to identify the 'white space' areas where the Foundation can make a distinctive contribution in this area
- work with partners to offer apprenticeship schemes to enhance the knowledge and skills of the workforce, and help to widen access to engineering and technology opportunities to women
- help to widen access to specific disadvantaged communities outside the UK through distance learning and complementary initiatives.



### Work experience benefits all EDT's Year in Industry

In 2013/14, we continued to support the Engineering Development Trust's (EDT) Year in Industry (YINI) scheme, helping 20 young people to gain experience of real industrial challenges. These young people work in SMEs and top companies around the UK for a period of up to a year. The scheme can have a massive impact on the young people's lives.

The winner of the YINI's 2013 Contribution to the Business Award was one of our funded students, Ciarán McEvoy, who spent his time at Ingimex Ltd, the UK's largest manufacturer of light commercial vehicle bodies for dropside, tipper and Luton van conversions.

Ciarán developed a panel ejection system that virtually automated the transition of the side panel assembly on to the next stage. The overall time taken at this step was greatly reduced, as he entirely removed a bottleneck and subsequent downtime. The net result of this work was a reduction by a third of a critical stage in building the Luton van.

"Finally, I was able to put the maths that I had learnt at school into practice, forcing me to remember and therefore embed things I thought I'd long forgotten,"

Ciarán said: "I found my interpersonal skills stretched, for I had to befriend all the different departments to gain co-operation and trust, to follow my project through to the end. ... the transition between school and the working life was the coming to reality of no longer being spoon-fed the question and answer and having to go out of my way to find both. Nearly all the unemployed university graduates I've spoken to have the one common problem: lack of experience, so would I recommend the Year in Industry? In a word; definitely!"



To find out more visit [www.etrust.org.uk/the-year-in-industry/about-yini](http://www.etrust.org.uk/the-year-in-industry/about-yini)



## Governance and management

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



### 1 Thomas Thune Andersen

Thomas is the Chairman of the Lloyd's Register Foundation and Chairman of Lloyd's Register Group Limited. Thomas, a former member of the board for the A.P. Moller-Maersk Group with almost 32 years in the maritime and energy sectors, was appointed to the board of Lloyd's Register in June 2010. He is Chairman at Dong Energy A/S and a board director of Petrofac and of VKR Holdings, the parent group of Velux.

### 2 Sir Brian Bender

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 governor of Dulwich College, among other posts.



### 3 Ron Henderson

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.

### 4 Rosemary Martin

Rosemary is Group General Counsel and Company Secretary of Vodafone Group and was previously CEO of the Practical Law Group. She is a non-executive director of HSBC Bank Plc and a member of the Financial Services Authority's Listing Group Advisory Committee.



### 5 Carol Sargeant

Carol has non-executive positions on the boards of Danske Bank, Martin Currie and Secure Trust Bank. She is also Chairman of Public Concern at Work and Chairman of the BSI Standards Strategy and Policy Committee. She has previously been Managing Director on the board of the FSA, and Chief Risk Officer at Lloyds Banking Group, having begun her career at the Bank of England.

### 6 Lambros Varnavides

Lambros is the former Managing Director and Global Head of Shipping at The Royal Bank of Scotland. He serves as a director of the Baltic Exchange and sits on its Finance and Charity Committee. He is also a court assistant to the Worshipful Company of Shipwrights and sits on its Finance Committee. He chairs the Grants Committee.



The Board is currently made up of six trustees who are also the members and directors of the Foundation for Companies Act purposes. The Board considers Foundation policies, receives committee reports and recommendations, approves annual budgets, reviews the performance of the trading arm, and guides the Managing Director.

The Board is supported by four sub-committees, which have delegated authority on certain matters (investment; grants; audit and risk; and nominations). Trustees and other non-executives sit on these sub-committees.

The Managing Director, Richard Clegg, is responsible to the Board for the operation of the Foundation.

For the future, there are likely to be factors inside and outside the Foundation's control that are relevant to achieving our objectives. In the case of the management of risks, these are monitored by the Board of Trustees and the Audit and Risk Sub-Committee. Risks are identified and assessed and controls are reviewed throughout the year.

We have worked hard to build up an appropriate governance structure that is consistent with our charitable vision. Under this structure, there is a clear separation between the Foundation's charitable activities and the profit-making activities of Lloyd's Register.

#### **Organisational structure**

The Foundation has a total of five dedicated staff. A Service Level Agreement exists between the Foundation and its trading arm, LR, 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.

#### **Grant making policy**

All major grant applications are peer reviewed by the Grants Committee, a sub-committee of the Board. Independent expert advice is also sought on defining the scope of research areas where the Foundation is planning to award grants. Final decisions on these applications are made by the trustees. The Managing Director has delegated authority from the Board to approve small grants up to £50,000 and to incur expenditure agreed by the Board.

Details of available funding and the application process are published on our web site and notified on social media. Grant holders are required to submit staged reports as part of the process to track delivery against the agreed grant objectives, as well as to monitor the impact and public benefit being generated.



Lloyd's Register  
Foundation

Life matters

**Lloyd's Register Foundation**

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and owner of Lloyd's Register Group Limited.

Registered Office:  
71 Fenchurch Street, London, EC3M 4BS, United Kingdom.

Produced by Lloyd's Register Group Communications

Design and production  
**CONRAN DESIGN GROUP**

Printed by Pureprint

