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## INNOVATION AND TECHNOLOGY

Technology and innovation are at the heart of Rolls-Royce. We anticipate technology then create products and services that our customers need ahead of market requirements.

In 2014, we spent £1.2 billion gross in R&D and filed for 600 patents.

## ENGINEERING STRENGTH

Our 15,500\* engineers, along with our supply chain, commercialise and deploy the continuous stream of science developed by our university partners into technology then products. Competitive technology comes from combining great people, tools and processes. These fundamental building blocks are used across our two Divisions, Aerospace and Land & Sea. We also continually invest in new talent and in 2014 we recruited 354 graduates (254 of which went into engineering) and 357 apprentices. Technical people are the lifeblood of the Company. Our investment in technical and leadership training allows us to continuously develop world-class professionals.

## INNOVATION

We have a track record over many years of creating new products and services and we continue to strive to be leading edge in everything we do. Innovation cannot be left to chance. It needs to be encouraged, managed, selected and pulled through into products and services. Harnessing the total intellectual power of our people takes enthusiasm and effort. Our new Innovation Portal, Big Ideas Forums and Open Innovation challenge have been successful and each year we reward the most



Our partnership in seven Advanced Manufacturing Research Centres (AMRCs) bridges the gap between research and industrial application; providing facilities for industrial partners and academics to develop new manufacturing technology.

For example, innovative manufacturing techniques developed in our AMRC in Sheffield, UK, are now deployed in our state-of-the-art disc facility in Washington, UK.

innovative ideas at our Sir Henry Royce Technology Awards. We look at innovation in terms of technology and services and also in the way we conduct engineering and manufacturing. This ensures that we continuously simplify and improve processes in order to be efficient and remove waste.

## RESEARCH AND DEVELOPMENT

The strength of our current product portfolio results from consistent and long-term investment in R&D and our ability to bring technology to industrial applications. In addition to our extensive in-house technology capability, we have partnerships with world-leading universities in order to create new technology. We continuously invest in our global network of 31 world-class University Technology Centres (UTCs) where we build the foundation for the next generation of products. These technologies feed into our demonstration programmes, where robust validation takes place before proceeding in a structured and controlled way into new production.

**£1.2bn**  
R&D INVESTMENT



## DEMONSTRATOR PROGRAMMES

During 2014, progress was made on our many new technologies, for example, the carbon titanium fan has flown for the first time this year in the advanced low-pressure systems (ALPS) demonstrator, a modified Trent. The composite fan system has been developed with the help of four UTCs and five AMRCs and will offer over 750lbs of weight saving on our future large engines. We have demonstrated a new mobile MTU gas engine which has been in development since 2013. This high-speed gas engine offers a fuel alternative whilst maintaining the level of performance expected from our high-speed diesel engines. At our Dahlewitz site in Germany, we are building a new test facility for power gearboxes. These gearboxes will be used on the next generation UltraFan engine and should offer a 25% improvement in fuel efficiency when compared to the Trent 700.

\* total as at end of 2014

## OUR 'VISION' APPROACH

### WE LOOK AT TECHNOLOGY ACQUISITION OVER A 5, 10 AND 20-YEAR HORIZON.

#### VISION 5

Vision 5 describes near-term technologies that are ready to introduce into our products. For instance, this year we have successfully demonstrated our low observability propulsion and exhaust system integration capability on the BAE Systems Taranis unmanned aerial vehicle. On reciprocating engines our dual-fuel injector design enables pre-mixed high pressure gas combustion and allows the operator to switch from gas to liquid fuel during operation.

#### VISION 10

Vision 10 describes leading-edge, validated technologies for application in the 'medium term'. Most of these are at demonstration level today and will feature in the next generation of products. For example, the lean burn combustion system for aero gas turbines has been in development for some years and offers a 60% reduction in the pollutant NO<sub>x</sub> and particulate matter (smoke) compared to year 2000 levels. It will reach flight test in 2015 and is supported by the European Clean Sky Programme.

#### VISION 20

Vision 20 describes emerging, or as yet unproven, technologies which may be applied across our product range in both Aerospace and Land & Sea. For example, we are developing concepts for autonomous ships to reduce operating costs and radically simplify onboard facilities.

## MARKET OUTLOOK

The Group has identified markets where our skills and technology add value for our customers and deliver value for shareholders. As a long-term business we assess the market potential over a 20-year horizon.

Through the customer-facing businesses that make up our two Divisions, we are delivering better power in the air, on land and at sea.

Our technology, skills and customer insight position us to have the right products and services today and for the future.



### AEROSPACE DIVISION

### LAND & SEA DIVISION

**Aerospace potential**  
for OE and services  
over the next **20 years**



**US\$2,300bn<sup>†</sup>**

#### CIVIL AEROSPACE

We estimate that the global civil engine market will be worth approximately US\$1,900 billion over the next 20 years, with US\$1,250 billion being for original equipment (OE) and US\$650 billion for aftermarket services. Over half of this value comprises engines for twin-aisle airliners and large business jets.

#### POWER SYSTEMS

We estimate the off-highway reciprocating engine markets we address offer an opportunity of £500 billion over the next 20 years for OE. The total service-related market will offer a potential of around a third of that OE value, or £150 billion.

**Land & Sea potential**  
for OE and services  
over the next **20 years**



**£1,300bn<sup>†</sup>**

#### DEFENCE AEROSPACE

The defence market opportunity over the next 20 years is US\$125-150 billion in OE and US\$225-250 billion in services.

#### MARINE

We forecast a business opportunity (excluding reciprocating engines) across the offshore, merchant and naval market segments over the next 20 years of £170 billion for OE and £80 billion for associated services.

#### NUCLEAR

The demand for mission-critical equipment, systems and engineering services for civil nuclear could reach £220 billion over the next 20 years, while the demand for associated reactor support services could amount to £140 billion over the same period.

<sup>†</sup> Rounded to the nearest 100bn

# STRATEGY

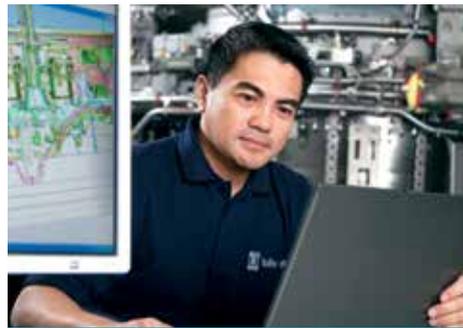
We are a power systems company competing globally. We win in our chosen markets by focusing on, and connecting, three powerful themes: customer, innovation and profitable growth.



## CUSTOMER



Placing the customer at the heart of our organisation is key. We listen to our customers, share ideas, really understand their needs and then relentlessly focus on delivering our promises.



## INNOVATION



This is our lifeblood. We continually innovate to remain competitive. To drive innovation, we create the right environment – curious, challenging, unafraid of failure, disciplined, open-minded and able to change with pace. Most importantly, we ensure our innovation is relevant to our customers' needs.



## PROFITABLE GROWTH



By focusing on our customers and offering them a competitive portfolio of products and services, we create the opportunity to grow our market share. We have to make sure that we are not just growing, but growing profitably. That means ensuring our costs are competitive. We look after our cash and we win right.

## PEOPLE



Our people are the key enabler of our strategy. We are committed to recruiting, developing and retaining the best and to creating a climate for success. We are building a business-orientated, innovative and cost-conscious culture, where our people feel connected to the needs of our customers, the needs of our shareholders and the needs of our broader communities.

SEE PAGES 44 TO 47 FOR MORE INFORMATION ON HOW SUSTAINABILITY PLAYS A PIVOTAL ROLE IN THE DELIVERY OF OUR STRATEGY

# BUSINESS MODEL

We bring advanced technology to market through integrated power and propulsion systems and services for use in the air, on land and at sea.

Engineering excellence is a fundamental source of competitive advantage across the Group. Our methods, processes and experience enable us to deliver complex, high-value programmes. Our ability to optimise and integrate entire systems is a core competence informed by a close understanding of customer needs and decades of domain knowledge.

Addressing complementary markets from a shared capability and technology base brings breadth and scale, diversity and balance, enabling us to invest efficiently, and providing the resilience required to offset new project risk. Our manufacturing model is consistent across the Group; we only produce parts ourselves where we can create and sustain a competitive advantage.

The balance of our supply chain is built around close and long-standing relationships with key partners and suppliers, a model that provides flexibility of capacity and secures access to world-class capability. Some partners, as well as supplying parts, share in the risks and rewards of the whole programme from research and development to manufacture, through risk and revenue sharing arrangements.

Services are an essential part of our business, building customer relationships and providing revenue stability by moderating the effects of new equipment order cycles. Services offer strong growth potential and the opportunity to align incentives through long-term service contracts, providing visibility of costs to our customers and helping us secure future revenues. This is particularly the case in Civil aerospace where contractual and air safety considerations mean that we have rights that secure a large part of the aftermarket spare parts business even where we do not have a TotalCare® agreement.

The operation of our business model over decades has resulted in a substantial and growing installed base of engines at all stages of the product life cycle. Cash flows today from investments made, in some cases many years ago, support investment for the future. We are focused on making this proven business model more effective through relentless focus on costs to generate the funds to sustain the investment necessary to remain competitive.

## CONNECT TECHNOLOGY TO CUSTOMER NEEDS

Our deep understanding of customer needs drives the development of new technologies and products.



## AEROSPACE

Gas turbines

Large & global

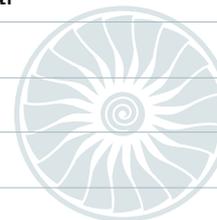
High

High

5-20 years

40+ years

Substantial and growing



## ALLOCATE CAPITAL TO NEW GROWTH

We operate a disciplined capital allocation process across the Group. We invest only where we believe we can create and sustain a competitive advantage and achieve a good return for shareholders.



**INVEST IN R&D AND SKILLED PEOPLE**

Developing and protecting leading-edge technology and deploying it across our businesses allows us to compete on a global basis and creates high barriers to entry.



**DESIGN AND MAKE WORLD-CLASS PRODUCTS**

We differentiate on performance. We win and retain customers by developing and delivering products that provide more capability and offer better through-life value than those of our competitors.



**LAND & SEA**

← POWER SOURCE →	Reciprocating engines	Nuclear
← CUSTOMER BASE →	Large & global	Global
← BARRIERS TO ENTRY →	Medium/high	High
← INVESTMENT REQUIRED →	Low/medium	Low/medium
← DEVELOPMENT TIME →	2-8 years	20 years
← PRODUCT LIFE →	20+ years	40+ years
← SERVICE OPPORTUNITY →	Growing	Growing



**SECURE AND MAXIMISE SERVICE OPPORTUNITY**

Our equipment is in service for decades. Our deep design knowledge and in-service experience ensures that we are best placed to optimise product performance and availability.



**GROW MARKET SHARE AND INSTALLED BASE**

Our substantial order book for both original equipment and services provides good visibility of future revenues and provides a firm foundation to invest with confidence.

