THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

DINNER/DISCUSSION SUMMARY

Engineering: turning ideas into reality
The Select Committee Inquiry

Held at The Royal Society on 7th July, 2009

The Foundation is grateful for the support for this meeting from The Chartered Institute of Building Services Engineers, Energy Institute, Engineering Council UK, Engineering and Physical Sciences Research Council, Engineering and Technology Board, Garfield Weston Foundation, Institute of Physics, Institution of Chemical Engineers, Institution of Civil Engineers, The IET (Institution of Engineering and Technology), Institution of Mechanical Engineers, Institution of Railway Signal Engineers, The Royal Academy of Engineering and The Royal Commission for the Exhibition of 1851.

Chair: **The Earl of Selborne KBE FRS**
Chairman, The Foundation for Science and Technology

Speakers: **Phil Willis MP**
Chair, House of Commons Select Committee on Innovation, Universities, Science and Skills
The Lord Browne of Madingley FRS FREng
President, The Royal Academy of Engineering
Richard Olver FREng
Chairman, BAE Systems plc

MR WILLIS said his committee (the Select Committee on Innovation, Universities, Science and Skills) had chosen engineering as the subject of their report because it was fundamental to all the subjects his committee covered. Engineering was vital in the UK economy; between one quarter and one third of GDP was dependent on it; and it was essential for existing energy, water and environmental policies and even more so for major projects such as the Olympics, Crossrail, and housing and schools expansion. The constraint was the lack of engineering capacity and skills. To remedy it we needed to raise the output of STEM graduates from the current thirteen per cent to twenty five per cent. The problem lay in the schools; children were not excited by engineering and lacked proper career advice. Companies also needed financial help to cover the "valley of death" - i.e. the gap between discovery and commercialization. The Committee had looked at three case studies - nuclear, plastic electricity and geoengineering, where the UK could have the capacity to create world class industries. The Committee had recommended, and the Government accepted, that engineering advice was essential for all policies, that there was insufficient engineering expertise in the civil service; that procurement policies should be used to spur innovation; that road maps were needed for major projects; that the public and private sectors should cooperate closely; that more generalist engineers were needed; and that the RAE (The Royal Academy of Engineering) should exercise a coordinating role and be the first port of call when the Government sought engineering advice. But they were disappointed that the Government had not accepted the recommendation that their should be a Chief Engineering Adviser, working under Professor Beddington in the Cabinet Office, and that all Departments should have engineering advisers.

LORD BROWNE welcomed the Select Committee's report. The economy needed to be diverse and to encourage opportunities in both services and manufacturing. In both these areas engineering skills were vital. Capacity was a concern but admissions to engineering degrees were rising and eighty nine per cent of engineering graduates went into engineering roles. Causes for optimism were the recognition that engineering was important; that UK engineering skills were highly valued abroad; that multinationals undertook research and development in the UK; and that the Government had recognized the importance of diversity. Innovation needed both science and engineering in order to translate discovery into commercial success, and to persuade companies to undertake research. It was engineering that solved the practical problems. Collaboration was essential both between government and the private sector, but also between various engineering professional institutes. There was no need to restructure the thirty six engineering institutes; they could collaborate together under the coordinating leadership of the RAE and speak with a unified voice. The UK needed to concentrate on areas of high expertise with significant added value. We would not compete on cost, but on quality and skill. This demanded more and higher quality engineers. Only with them could we develop the low carbon economy - vital both for the world and our own economic interest. To get to a low carbon world we needed - as with JFK's drive for a moon landing - an act of faith. Enthusing the young about engineering so that we can put the engineering resources in place was the first step.

MR OLVER also welcomed the Select Committee's report, and like Mr. Willis regretted the Government's rejection of the recommendation to appoint a Chief Engineering Adviser. We needed to keep the pressure on Government to reconsider their view. Although the current downturn meant that a number of manufacturing companies, particularly car firms, were suffering badly, the demand for engineers was high and would grow. The engineering sector still provided thirteen per cent of GDP; the need for new infrastructure, for methods of meeting climate change, and preserving ecosystems would increase demand. A strategy to produce engineers who could provide the management, financial and communication skills, as well as pure engineering expertise, was needed. Engineers needed to be able to cope with restructuring, and be open to reskilling. He agreed with Lord Browne that the UK must concentrate on high value products and services to compete in the world market. This meant working to ensure that outstanding talent and intellectual property stayed in the UK. We should not compete on cost, but take advantage of the reputation of our legal system, our know how and academic base to seize the opportunity for high value added work in areas such as defence, aerospace, cyber security and nanotechnology. The problem was lack of skills. Sixty six per cent of employers said they had difficulty in finding enough STEM graduates. Moreover there were very low skills in much of the workforce - illiteracy and innumeracy. Business could do more with business ambassadors in schools, furthering the apprenticeship schemes, and collaborating with educational establishments and government. We needed to change attitudes in society to engineers; understand their

achievements, give them greater encouragement and raise their status.

A number of speakers in the following discussion also welcomed the report, and felt that it would give a significant boost to the reputation of engineers, and a wider understanding of their importance for the economy. The recognition by the Government that issues raised by the Report must be taken seriously was welcomed. While some supported Mr. Olver's view that the Government should reconsider its rejection of the recommendation of a Chief Engineering Adviser, there was more emphasis on the need to improve engineering skills and awareness in Government departments. The acceptance by the Government of the Committee's view that good engineering advice should be sought on major policies, and that departments should be able to be more intelligent customers, with greater in-house capability, was important. Also important was the acceptance of the coordinating and primary advice function of the RAE. But a speaker doubted whether the message had got through; he noted that the Department of Energy and Climate Change had recently advertised for policy leaders, but did not consider knowledge of its remit essential.

Speakers also supported the Committee's view that more generalist engineers were needed, with the ability not only to make use of different engineering skills, but, above all, to have sufficient flexibility to absorb management and financial opportunities. There was concern over the "silo" effect resulting from the training and professional qualification demands put on engineers. While it was obviously important that many, perhaps most, engineers would want to work within their own specific discipline and become more expert in it, this should not be at the expense of providing opportunities for those who were able, and wished, to go wider. The silo problem started in academia, where universities had to structure their degrees around the requirements of the professional institutes; the institutes should recognize that their requirements should enable universities to offer sufficient training in financial and management issues, so that graduates had an understanding of what opportunities might to open to them, and what further skills were needed. If engineers were to be employed (as they should be) as project managers, they needed to be generalist engineers but also have these wider skills. In a rapidly changing economy, with the need for greater diversity, engineering graduates should understand that they might need to retrain and reskill over their employment lifetime. But, often, the fear of change was not the result of narrow professional requirements, but was a mental attitude. Of course, a move involved risk, but it could often be successful, as many moves in the less risk adverse culture in the US showed. It was suggested that the specialist qualifications that a company needed from its engineers should be provided by the company, when it had been able to assess the abilities of its entrants. The universities should concentrate of delivering intellectually rigorous graduates who understood what skills were necessary to succeed in the workplace. Engineering was a good training for all manner of jobs (as shown by the number who had had successful careers in other professions) but the basic capability to accept change should be laid down early on.

How to inspire the young for engineering, and how to promote the reputation and standing of engineers were issues raised. A ten year old loved to see how things worked, and to experiment so he (she) should want to become an engineer. But in secondary school, there was no time for experiment and the curriculum was driven by SATS and exams. Engineering was seen as something which demanded boring learning of difficult subjects with no excitement (various views were expressed on whether maths was difficult; those who had had good teacher's said no; but good teachers were few). It was at this stage that Business Ambassadors, going into schools and showing how exciting and important engineering work was, were important. It was at this stage too, that good career advice should be given by staff who were not (as, alas, was often the case) those who had been given the job because were not very good teachers, but those who knew what outside opportunities existed and how to work for them. Young people would respond to the argument that we must have engineers if we are to deal with climate change and environmental degradation - and that it was engineers, not scientists, that enabled man to land on the moon. Some speakers thought that we would not get more STEM graduates without greater incentives, such as paying teachers of STEM subjects more: giving STEM students higher grants; and increasing the funding for laboratory subjects in universities.

The reputation and status of engineers would start to rise when young people understood their importance and value and wished to enter the profession. But meanwhile much could be done within the profession. Engineers should consider why it was so male dominated, with few women; and why there was such a small ethnic intake. There were different views on whether it would be helpful if engineers could have some title, as doctors did, and call themselves, as German engineers did Mr Ing. XXXX. The RAE, as a coordinating body could do much to focus public attention on engineers as a profession with many different branches but an underlying and common purpose in improving, both nationally and globally, human life.

Sir Geoffrey Chipperfield KCB

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