

# The Worshipful Company of Engineers

(Incorporated by Royal Charter 2004)

## The Swordsman Newsletter

Issue 25, November 2010



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## COVER PHOTOGRAPHS

Top Left	The Master, John Robinson and Doreen, happy and relaxed at the end of the golf day
Top Centre	The Humber Bridge from the Control Room
Top Right	The Master, John Robinson and Doreen at Castle Howard
Second Left	Beverley Minster Organ looking through the removable boss hole from the workshop
Second Right	Beverley Minster. The removable boss back in place over the transept
Bottom	The Master, Wardens and Principal Guests at Mansion House on 29th October 2010

## FUTURE EVENTS

15th December 2010	Carol Service	Tower of London
1st March 2011	Election Court Meeting and Dinner	Wax Chandlers' Hall
1st April 2011	United Guilds' Service	St Paul's Cathedral
12th April 2011	Installation Court, Common Hall and Dinner	Drapers' Hall
13th April 2011	Ladies Brooch Luncheon	Wax Chandlers' Hall
8th June 2011	Warden's Lecture and Luncheon	Tbc
24th June 2011	Election of Sheriffs	Guildhall
12th July 2011	Awards Dinner	Plasterers' Hall
26th July 2011	Golf Championship	Beaconsfield Golf Club
22nd to 25th September 2011	Out of Town Meeting	Edinburgh

## EDITORIAL

It does not seem long ago that I was preparing Edition 24 of the Swordsman but we have many exciting events since then on which reports are included in this edition together with Papers by the Junior Warden and the winner of the Hawley Award this year and an update on her progress by last years winner. This edition is therefore very full and I have reduced the size of the type face slightly to save space. I hope that this does not detract from the ease of reading but if so please let me know. As I am now including more Members' News as it is related to me I have decided to rename Personalia (a word made up, I believe, by my wordsmith predecessor as Editor, Past Master David Mitchell) as Company News and Member's News. Perhaps that is not so catchy but it is more descriptive of the purpose of the Sections.

In these challenging times it is good to see that infrastructure has not been hit as hard as it might have been in the spending review. At long last perhaps this is recognition of the importance of Engineering within the community in providing the transport links, the buildings, the energy and water utilities and the system and communications that will be the driver for future success. The speeches at dinners and papers have all emphasised their importance. The Election of Liveryman Alderman Michael Bear as the Lord Mayor for 2010 to 2011 hopefully will enhance the importance of Engineering to the City and the Country.

As always I would like to thank the willing reporters of the Company's Events who make my job much easier and I hope that you enjoy reading this edition. If I have not asked you to report yet and you would like to contribute please do let me know. Letters and original articles from Liverymen are always welcome. My email address is below.

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# THE WARDEN'S LECTURE

## 9th June 2010

### RAF Club, Piccadilly

The Junior Warden-Elect, AVM Graham Skinner CBE, RAF, gave a thought-provoking and stimulating lecture on The Outsourcing of Defence Engineering to a well attended, and attentive, audience.



The lecture set out for the non-expert listener the complex and often byzantine attempts to organise logistics for the Armed Forces over several decades. This was driven by economic, political and military considerations, with change, led by dogma as much as necessity, being a constant feature of the process. The Junior Warden-Elect delivered the lecture in an informed and clear

manner, together with an engaging style. He accompanied points with well-chosen diagrams and pictures, and provided compelling examples of outcomes at each stage.

The paper presented follows here:

## THE OUTSOURCING OF DEFENCE ENGINEERING

**Air Vice-Marshal G Skinner CBE**  
**Junior Warden-Elect**

There has been a long history of contracting out the support of the Armed Services to industrial and commercial specialist businesses. With varying justification the received wisdom is that this process of outsourcing produces financial savings and relieves the uniformed serviceman to concentrate on core war-fighting activities.

This process has accelerated in recent years under a succession of government-inspired initiatives overlaid on demanding changes in defence commitments. These changes range from the citadel defence arrangements of the relatively stable Cold War period to coalition force structures prosecuting expeditionary warfare. Additionally, to further complicate the issue from an engineering perspective, military equipment is being retained in-service longer and has needed extensive modification for intensive and prolonged use in new and novel forms of battlefield employment. The overall levels of skill in the embedded Services engineer staff are diluted through lack of experienced resources to sustain operational capability and

the alternative personnel in industry have only a low level of experience in deployed operations. These concerns can all combine adversely to undermine the effectiveness of support of the front line and need to be taken into consideration during the deliberations for the forthcoming Strategic Security & Defence Review to ensure the balance of risk is acceptable.

This presentation is based on a combination of my experience while serving a full career up in the Royal Air Force when I was fortunate to be involved closely with the engineering of all the main aircraft types and associated weapon systems, saw the first Gulf War in the Joint Headquarters at High Wycombe, and in due course retired after being the last Commander-in-Chief of Logistics Command in 2000.

Subsequently I have been able to draw on my post Service experiences over the last 10 years providing consultancy advice to the defence contractor industry and, in particular, as the Military Adviser to Marshall Aerospace at Cambridge. Also on my lectures and research whilst a Visiting Professor at the Defence Academy's Royal Military College of Science, Shrivenham and offering advice there to middle ranking officers from all 3 Services and civil servants on Defence Logistics Policy.

In contrast to that situation, today my audience is much broader in its experience – some of you are experts through direct duties with HM Forces and consultants yourselves in this genre but others are more generalist engineers with no direct contact with the Services and only aware of the changes that have occurred in this area. My aim is to try to draw a middle path between these extremes, to give a broader understanding of the situation today from the history of the past and to leave you to ask any deeper questions at a later stage.

To begin though it is clear from my own personal history this lecture and analysis with its examples are weighted towards the air environment. But in mitigation, it can be argued that in many instances, this was the area that was the fleet leader within the MOD in new ways of working with innovative contracting methods and the resulting experience has been read across generally throughout the whole environment with the result that can be seen in the Defence-wide contracting out of support including engineering.

**MACHIAVELLI**  
(1469-1527)

*Machiavelli cited as a warning the example of the Romans who apparently began outsourcing their defences to the Goths – achieved a downsizing of their legions but eventually led to the sack of Rome.*

In an ultimate example of the outsourcing of fighting activities to a third party, Machiavelli cited as a warning the example of the Romans who apparently began outsourcing their defence to the Goths; they achieved a downsizing of their legions but this eventually led to the sack of Rome. Whilst we have yet to go that far generally, Service Chiefs have always wished to sustain retention of their own troops and support and have cited in justification some spectacular failures in the past. These have ranged from inadequate camp infrastructure supplied from civilian commissaries under Treasury direction at Balaklava during the Crimea War, through to the hampering of tank movement by trade unions during the Suez campaign, structural damage during maintenance to Tornado F2 aircraft by Airwork Ltd at St Athan in 1988, inflated industrial costs in-theatre during Gulf War 1, and back to poor camp infrastructure in Kosovo in 1999.

With such a background and even with well-written contracts the military commander has always preferred to have his support under his control. Master General Ordnance asked for his own Balloon Factory at Farnborough in 1900 when it looked like there might be some military value in aviation. Historically, commanders want their engineers and logisticians put in uniform and it was failures of specific contracts to deliver that helped this cause – sometimes because the contractor was too close to the frontline, for example French stevedores in Calais abandoned the unloading of a British motor brigade after a Stuka attack in 1940 and in 1999 there were SCUD attacks on the rear repair areas of the Coalition Forces in the Liberation of Kuwait that caused a ‘flurry’ in the wrong direction amongst the civilian industrial contractors; sometimes it was a result of industrial action and the threat of bankruptcy at Rolls-Royce, for example, that triggered the sustenance of in-depth fast-jet aero-engine repair to the Maintenance Unit at RAF St Athan in 1970.

It seems that if the perceived physical risk to the contractor is too great or the business risks are too high then any contract, no matter how tight, might not be honoured; it is at these times the military commander reiterates his strong desire for ‘self sufficiency’ in those critical support areas and argues that outsourcing to industry should occur only if an in-house capability was unobtainable.

Nothing withstanding their personal and corporate desires, Military commanders do not operate in isolation and are subjected to external pressures from their ministerial and civil service chains of command through direct policy initiatives or by budgetary constraints. There has been a drive to improve the efficiency of Service’s in-house engineering and support. Many of these arising from the Defence Cost studies precursors of the first Strategic Defence Review when, without robust justification and generally based on parametric analysis, outside consultants together with the civil service produced estimations of significant savings in real estate, manpower and materiel by wholesale adoption of industrial methodology with the re-organisation of the three Services procurement and support organisation.

The industrial sector has been encouraged to bid for defence support work as orders for new equipment has dried up. The last 20 years has seen a succession of initiatives from the Defence Cost Studies behind the first Strategic Defence Review, then the application of government –wide ideas of Competing for Quality and Next Steps Agencies, Public Finance Initiatives (PFI) and Public-Private Partnerships. In the PFI area alone there was a period of significant growth in the outsourcing of defence from 1995-2001 with very significant values of the Public Sector Comparator (PSC) – the measure of the long term costs of doing the task in the same way. Some of these have been successful, such as the Heavy Equipment Transporter replacements which also use Royal Logistic Corps sponsored reserves as part of the manpower mix. Others have been less so and the Future Strategic Tanker aircraft project – this was first outlined in 1998 with a complete outsourcing of the replacement service of the Tristar and VC10 tankers to a ‘hoses in the sky’ concept with a payment regime based on availability and usage with a revenue scheme for civil charter use of the tankers when not required for military operations. It has been struggling since after a prolonged battle between rival consortia with Boeing 757 and Airbus 330-220 aircraft, and then with the concept of civil aircraft on military operations, and the infrastructure needs at RAF Brize Norton – this means that the most likely first in-service date is 2012 at best. This has also required the aging airframe structures of the VC10 (in-service since 1966) and the Tristar (second hand in 1984 after the Falklands War) to have had to be kept in-service by the engineers for much longer than had ever been considered at initial service entry.



This aspect of unintended longevity of equipment illustrates the demands on engineering expertise that are made by military equipment systems. Using an air example, but this could equally apply in the context of land or sea, there are major differences between civilian aircraft operations and the operational Services. At the main purpose end of the spectrum, military aircraft are designed for the airborne release of payload (often offensive weapons but can be parachute or free-fall humanitarian loads). Then moving through the dimensions there are always significant variations in initial use such that aircraft are extensively modified, often at short notice with quick reaction procedures such as Special Trial Fits to Urgent Operational

Requirements subsequently. Additionally, aircraft are in-service for much longer periods with obsolescence of spare parts or the banning of no-longer-legal substances becoming a major concern. The changing complexity of the life long support chain is a significant factor in aging systems. There is also difference between military and civil flying operational risk and a design philosophy to understand too. Furthermore, there is always the chance of ‘Murphy’s Law’ coming into play into the military environment when there is less margin for error. All these aspects require a deep understanding by the engineering chain of command that is built-up through experience in practical and staff appointments at all levels of maintenance to such an extent that loss of any element in the exposure of an engineer through the outsourcing of it to industry carries with it a risk to the robustness of the system.

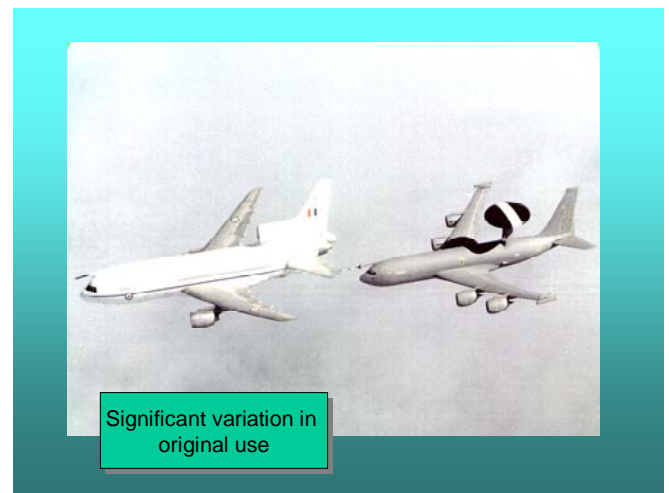
Fortunately, it is only occasionally that those risks adversely combine but they did so in the loss of Nimrod MR2 XV230 in mid-air over Afghanistan in 2006 with the loss of 14 UK personnel. Subsequently theatre use of the type ceased in March 2009 while fleet-wide safety modifications were implemented; the aircraft has now left service and there is a capability gap while waiting for the Nimrod MRA4 to come on in-line. For the ill-fated MR2, this maritime and anti-submarine aircraft had been modified to provide an overland surveillance capability and it was providing invaluable relevant intelligence data since 2001 over Iraq and Afghanistan. To provide maximum on-station time the air-to-air refuelling receiver capability, first fitted as a special requirement during the Falklands war, was being used extensively and the airframes were flying long hours over hostile terrain. The inquiry into the loss, unusually led at the highest level by an aviation- experienced QC, Mr Haddon-Cave, has reported in October 2009 that the aircraft fleet, and this airframe in particular, had not been sustained with a sufficiently robust airworthiness regime manned by

Nimrod Integrated Project Team for budget savings and initiatives over the last 10 years from the re-organisation of the MOD and the Defence Logistics Organisation in particular.

In December last year, the Secretary of State supported the view in the report that the MOD needs to overhaul radically the way it regulates and assures military airworthiness. The result is the formation of a Military Aviation Authority on 1<sup>st</sup> April 2010 lead by a 3- star Director General and with 3 pillars – Operating Safety, Military Air Accident Investigation Branch, and a Technical Safety Regulation Group to issue technical regulations, issue approvals and assure technical airworthiness to be lead by a 2-star Service engineer. It is hoped that this will give the right blend of skills and experience necessary as the centre piece of a new military flight safety regime. However, on the technical side because of the draw down over the last 10 years of manpower there are concerns that there are insufficient numbers of qualified Service engineers to fill the necessary posts and the failure to restore the level of a former Air Force Board appointment of a distinctive Chief Engineer (RAF) and the equivalent Procurement appointment of Controller Aircraft has been viewed as a significant risk still remaining in the technical regime.



Aircraft designed for airborne release of payload



Significant variation in original use

qualified service engineers who had received inadequate advice from Industry for the necessary balanced judgement of risk assessment of continuing Military Airworthiness to be made. Additionally, the inquiry believed that inadequate engineering resources of manpower and application were applied to sustain airworthiness and there was a direct casual link between downward pressures from the top onto the

The Defence Logistics Organisation came about from the recommendations of the original Strategic Defence Review which more specifically identified the method that the MOD should define its requirements for new equipment – an area that the National Audit Office had continually criticised for late delivery and budget excursions. The concept evolved into an ‘acquisition community’ with the front line commands providing military operational output to the Joint HQ – now at Northwood. The equipment user requirements were refined into a capability requirement – not a platform but an ability to achieve an objective – eg an anti-submarine detection capability could be achieved by one or more of fixed wing aircraft, helicopters, ships and submarines. The capability requirement was then managed by a single MOD source, the Capability Manager, where the various trade-offs of system were made to produce a specification that could be translated into an order on industry which in turn could be ‘output’ orientated should support be included. There was then an iterative process between the Equipment Capability

area and the procurement specialist area, the Defence Procurement Agency housed in a newly build award-winning office complex at Abbey Wood, near Bristol. Whilst this organisation concentrated on procuring new equipment, existing in-service equipment was supported by the Defence Logistics Organisation which had been made up by the amalgamation of the former responsibility areas of the Chief of Fleet Support, Quartermaster Master General, and Air Member for Logistics. The Defence Procurement Agency and the Defence Logistics Organisations were both big budget organisations and each commanded by 4-star officers. One of the important outcomes was that this change brought the support and long term life cycle requirements of in-service equipment, those items actually being used by the front-line commands now in-use for operations, up to the top defence table equally.

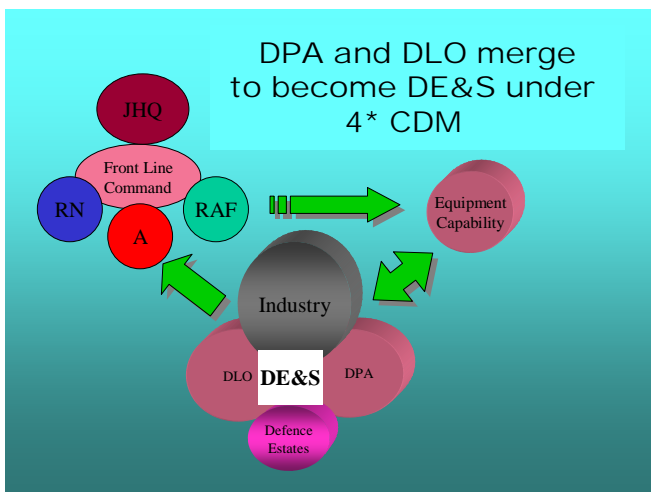
Embedded in the reorganisation philosophy was ‘SMART procurement’ which endeavoured to rectify the time and costs issues of military procurement and included engaging more-fully with industry in solutions for the capability requirements and the long term support. Underpinning the equipment needs are also real estate requirements and a separate agency, Defence Estates, is an integral part of the Defence Acquisition Community to take forward independently the build up of the naval bases for the new carriers or the closure of RAF Lyneham and facilitate the future Brize Norton Base. Three years ago there was an amalgamation of the Defence Procurement Agency and the Defence Logistics Agency into a combined Defence Equipment and Support organisation under a 4-star officer, Chief of Defence Materiel responsible for a budget of £13billion and with 22,500 staff.

Up to now the Chief of Defence Logistics has been a current serving officer but the Chief of Defence Procurement has not been; however the new combined post of Chief of Defence Materiel is presently filled by the former Chief of

because servicemen are increasingly deployed on operational duties and their budget costs are higher than those of the equivalent civil servants. Equally concerning though has been the dilution of professional engineering skills amongst the Integrated Project Teams of the Defence Equipment & Support organisation and, in turn, the dearth of servicemen with in-service engineering experience within the whole organisation to sustain the necessary levels of risk to be ‘As Low as Reasonably Practicable’ as well the required levels of operational capability in the field. Bridging the gap in experience has been an increasing reliance on industrial support and expertise bought in through output contracts.

The pressures for savings on each of the Services manpower budgets and Industry taking a larger share of the supporting arrangements for equipment in accordance with opportunities presented by successive MOD Defence Industrial Strategies have meant an inexorable draw down in numbers of servicemen available anyway. In the case of the Royal Air Force the numbers dropped from 90,000 in 1985 to around 41,000 now, but because output contracts mask the number of contractors actually working on RAF sites it is not possible to make like for like comparisons. However, it is suspected that the numbers of contractors together with the uniformed servicemen together make a total not dissimilar to that of the earlier figures. After evolving some complete outsourcing such as the early parachute drop training requirements (then to Hunting Contract Services), other RAF aircraft supported now by contractors include 32 Sqn (The Queen’s Flight), all advanced Hawk Flying Training, the Hercules fleet, and the Flying Schools with some aircraft such as the Defence Helicopter Flying School aircraft, Firefly and Grob Tutor not actually owned by the military at all.

This substitution of formerly indigenous engineering support by industry across a wide range of platforms against a limited uniformed requirement of servicemen who are established only to support deployed operations in general has meant that the viability of certain trades and a career structure for uniformed engineer officers has been less varied than in the past. This in turn has meant experience, especially of the management of ‘airworthiness’ with its equivalent concepts of ‘seaworthiness’, ‘landworthiness’ and ‘weapon safety’ in the other environments, has been diluted with insufficient numbers of qualified personnel to ensure robust chains of responsibility are maintained at the various levels of maintenance and management. This area of risk has been mentioned in the potential inadequacies of resourcing the delivery of the new Military Aviation Authority.

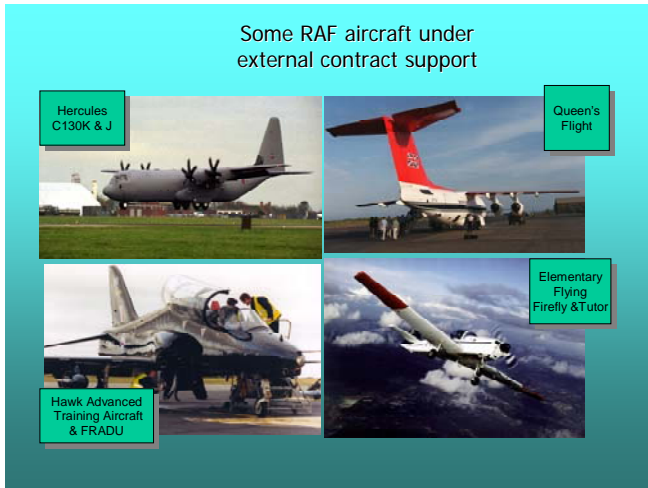


Defence Logistics but succession planning is presently active. This is indicative of the whole Defence Equipment & Support organisation which has increasingly proportionately smaller numbers of serving staff to be the genuine ‘intelligent customer’ and discharge the ‘MOD decider’ responsibilities from an ultimate user point of view. This is

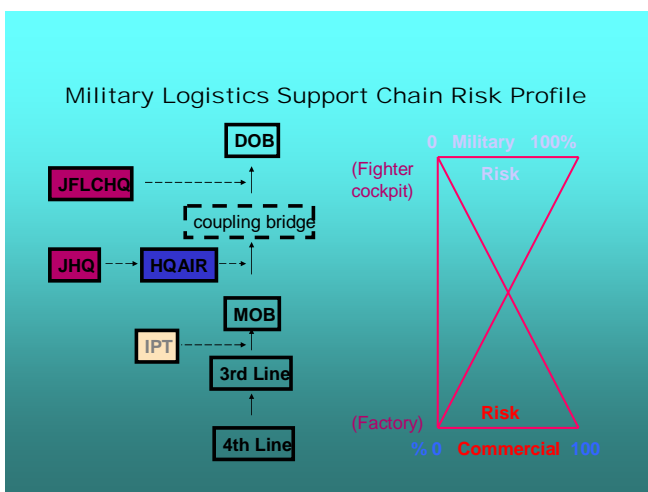
By way of background, for the range of servicing needs of equipment in the RAF a lexicon of places and depth of maintenance has been in general use. The places were called ‘lines of servicing’ and numbered from 1 to 4 with the first being the front line and the last the industrial contractor. The depth of activity at each of these places would vary with immediate replenishments for equipment use – fuel, oil, oxygen, weapons – known as Depth A through to major refurbishment and repair known as Depth D within Industry.

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The in-depth in-service resources were principally at 3<sup>rd</sup> line units known as ‘Maintenance Units’ with some elements of this work for limited ranges of equipment at 2<sup>nd</sup> line. The flows of activity and hence risk were managed by the MOD authorities for the equipment – moving from those of Engineering and Supply to the concepts of Support Authorities and into the Smart Procurement groups of the Integrated Project Teams (IPT) with embedded, but not necessarily in charge, engineer staff.



The military logistics support chain to deliver operational effect flows from 4<sup>th</sup> line upwards through the Main Operating Bases and for air power, via HQ Air Command under tasking from the Joint HQ, to the Deployed Operating Base for in-theatre tasking. In terms of risk, at the extremes of the fighter cockpit the operational commander requires war-fighting effect to be achieved on the battlefield within acceptable military risks and takes, little or no cognizance of the concerns of ‘commercial’ risks at the other end of the scale which would dominate the strategies of the contractor, especially if they were a publically quoted company, where close to 100% of its concerns are about share price and the analysts’ view of it in the financial market place.



The Integrated Project Teams or their earlier equivalents have been trying to determine new ways of working within this support chain for some time to deliver efficiency savings. As mentioned earlier the ‘non-teeth’ equipment,

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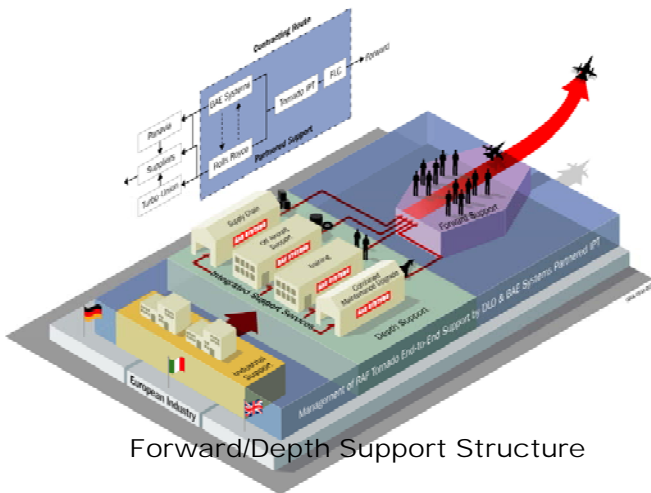
such as training aircraft, Queen’s Flight etc have been contracted directly to industry and this has resulted in a drop in requirement for the Maintenance Units and their supporting Supply Depots. As an example, applicable equally to the relevant organisations in the other 2 Services, from the 70s onwards there has been an inexorable draw-down of the 3<sup>rd</sup> line RAF supply and maintenance depots. This a mixed forced of uniformed specialists and civil servants reduced so that there is not one single stand-alone facility providing in-depth repair for RAF assets under RAF control. The Defence Aviation and Repair Agency (DARA), was a trading fund of the MOD formed 1<sup>st</sup> April 1999, derived from the RAF Maintenance Group with the MU at St Athan, No. 30 MU at Sealand, and the former Naval Aircraft Repair Organisation (NARO) responsible following the Templer report in 1965 for tri-Service rotary wing support. This element of RNAS Fleetlands and Almondbank was sold off to Vector Aerospace on 1<sup>st</sup> April 2008. The remaining DARA air activities were the uneconomic work of the VC10 and in due course DARA merged with the Army Base Repair Organisation (ABRO) on 1<sup>st</sup> April 2008 creating a new single trading fund, the Defence Support Group (DSG). The DSG is designed to focus expert maintenance repair overhaul and upgrade facilities to land and air based systems at a range of legacy sites including Bovingdon, Catterick, Sealand, Stafford, etc. Recently, it was announced that the DSG had teamed with General Dynamics (UK) who have secured preferred bidder status for the Army’s Future Rapid Effects System (FRES) programme. Whilst this sustains some in-house capability for UK forces only a very small percentage of 3800 personnel in DSG’s workforce are in uniform further emphasising the decline in this segment of experience, skill and reserve formerly held within the service manned deeper maintenance and repair units.

Efficiencies with the application of Lean techniques in the RAF fast jet support arrangements have resulted in the last 5 years with savings in 2000 engineering and logistics posts. Additionally, there have been successive iterations in the organisational and contract arrangements to collapse forward resources for the depth of work normally associated with 3<sup>rd</sup> line to the Main Operating Bases. The forward/depth structure for fast jets such as Tornado and Eurofighter Typhoon shows combined service and industrial (partnered BAE Systems and Rolls Royce) support. In the model, forward support is manned with mainly servicemen and possibly sponsored reserves with some specialist contract staff with the balance reducing as the depth of repair increases which has been further diluted in recent years with the prolonged detachments of servicemen to out-of-area operations. The result is that fewer and fewer servicemen have the deeper technical skills than in the past and the abilities to perform battle damage repairs in the field and other non-standard maintenance have been curtailed.

As an alternative to there has been a collapse back a solution for use on less critical assets such as the Air Transport Force. For example, the Hercules Integrated Operational Support contract under the joint management of Marshall Aerospace and the MOD Integrated Project Team at Cambridge is for an output orientated capability contract for

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the fleet over 25 years. This involves Lockheed Martin, Rolls Royce and Marshall Aerospace undertaking a significant proportion of the former 2<sup>nd</sup> level of work with



Forward/Depth Support Structure

the 3<sup>rd</sup> and 4<sup>th</sup> line activities all on site at Cambridge. This arrangement, as well as being extraordinarily successful with many economies coming to the fore to be rewarded jointly between the MOD and the contractors, does allow for long term continuity with investment encouraged in infra structure and improved processes. However, whilst there are some MOD staff on site with the contractor and some RAF technicians, the majority of work is undertaken by civilian contractors and as service manpower reduces more and more activity is being handed over.

There is evidence that tradesmen in the Air and Maritime environments are suffering from 'skill-fade' as there are fewer opportunities to establish and maintain deeper-type hand skills and diagnostic expertise. Current plans in the MOD are that by 2017 over 60% of all platform support will be delivered by contractor-led arrangements. This is made from the elements of the Maritime and Air (Rotary and Fixed Wing) of 70% contractor-led with the 60% of the Land support elements remaining 'traditional'. With this shift across the environments currently planned when setting up such contractor-led arrangements the MOD needs to ensure that there is a sufficiently experienced and skilled uniformed engineering chain embedded in the system for 'worthiness' considerations, that an intelligent customer capability remains for the MOD to discharge its decider responsibilities, and there are sufficient numbers of experienced servicemen (regulars or reserves) available to sustain the operational capability in the event of unexpected problems with the contractors in the short term.

Thus the loss of the deeper service maintenance facilities from direct control of the military commander in the UK has introduced a higher proportion of the commercial degree of risk being passed forwards into the delivery of operational capability. Those deeper facilities did provide an ability to surge in work capacity quickly and without any threats of industrial action. It is notable that in the US Forces there is also a long standing legal requirement for the service to retain a 'core capability' to organically support its weapon systems and must keep at least half of all maintenance

spending inside government depots. Furthermore at a recent Military Maintenance Repair and Overhaul conference it was reported that whilst the USAF believes that, as we do, that outcome-based contracting is the right way to deal with industry, they claim that even if defence budgets stagnate the depot system still has room to grow and a great deal of capacity available for partnerships. At this time it is reported that the USAF is abolishing previously outsourced deals to maintain its Boeing C-17s and F-22s – in the latter case a 3-year performance-based contract which is due to expire in 2012.

For the C-17s it is claimed the method of costing their calculating actual maintenance costs using the official USAF called Air Force Total Ownership Cost showing it to be the second lowest cost per flight hour for any air force aircraft is unreliable. The USAF are reported to show an analysis that C-17 is more expensive to maintain under Boeing's performance based logistics than the older Lockheed C-5 fleet maintained under USAF control at Warner Robins Air Logistics Centre in Georgia. Whatever the absolute figures it is interesting to note that the USAF has been revisiting its balance of work outsourced to industry and appears to be concluding that aircraft managed by its 'organic', in-house, depot system is cheaper than programmes managed by contractors. This is because the depots are not obliged to make a profit, only to recoup the cost of labour, materials and overhead without 'pass-through' costs of a mark-up from the contractor for taking on other sub-contractors.

Overall, it seems the USAF is making efforts to bring some of its maintenance programmes back in-house and this development should be carefully monitored in order to see what lessons there may be for 'in-sourcing' any of our own UK Services engineering support facilities.

The Defence Industrial Strategy 2005 acknowledged that it was important for the security of the UK to decide on what Defence Industrial capabilities need to be retained on-shore. However, despite a number of discussion documents and useful inputs from a variety of interested areas, this was not adequately followed through and remains an indeterminate issue to affect the Strategic Security & Defence Review considerations. The President of the Air League has recently



concluded that there are five reasons for an indigenous defence technical capability in the UK: sustaining the ability to validate performance and improve weapons; to deliver Urgent Operational Requirements; give value for money from on-shore Design Authority Organisations; retaining certain aspects of science and technology research to understand emerging threats adequately; to be able compete on a levelled-playing field by the new EU Defence and Security Procurement Directive.

While these reasons for on-shore capability are primarily advocated from industry's perspective, it is suggested that there is a valuable contribution to be made by uniformed engineers from all three Services towards in-service weapon system improvements, the delivery of operational modifications and bringing operating realism into the Design Authorities within Industry. Servicemen themselves bring to any industrial organisation valuable hands-on experience from recent war-fighting and varied deployment experiences to the technical-industrial dimensions. Furthermore, whilst Government is aware that certain on-shore capabilities are reaching critical mass in some areas, it may also be that additional roles to improve defence capability in general through service engineers within in-house facilities and embedded with the partnered contracts can be used to offset deficiencies in the UK's industrial capability.

Overall, care needs to be taken in the debate on the relationships of Defence Industrial Strategy and the Strategic Security & Defence Review not to lose sight of the indigenous capability that does remain from our embedded Services engineering resources and to use it, or even enhance it where industry is unable or unwilling to do so, to the advantage of UK's Defence Capability in general.

## Summary and Conclusions

There is a long history of concern by Service commanders through the ages of losing direct control over their support forces because of some of the failures that have occurred to undermine their responsibility to deliver battle-winning outcomes. More recently these concerns have been overridden by the need to find savings, peace dividends at the end of the Cold War, followed by major constraints on Governmental budgets in general which have reduced Service manpower and in-service facilities significantly. Reorganisation of MOD procurement and support organisations arising directly from the first Strategic Defence Review have accelerated this process along with the adoption of Government-wide schemes to fund Defence procurement and support projects in innovative long term ways that, inter alia, outsource engineering, supply and facilities to industrial contractors.

Whilst some of these contracts require uniformed servicemen, including sponsored reserves, to be embedded at the various elements of these arrangements, their roles are biased towards shallow engineering activity and the capacity to be deployed readily into in a battlefield of network centric warfare that is more demanding than ever before.

Undoubtedly it is true to report that there some outstanding personal contributions being made to operations by engineers in all three Services in the combat zones that have marked unfortunately the last decade or so. Indeed, in the Worshipful Company of Engineers we have direct evidence of this in the Services Awards that are given annually to individuals in the Royal Navy, the Royal Engineers, the Royal Electrical and Mechanical Engineers, the Royal Signals, the Royal Air Force in Air Command, as well as the Defence Equipment and Support organisation. In all cases the citations of Award Winners record exploits above and beyond the call of normal duty, to do more with less, and to innovate technically to achieve effects required on the front-line.



However, these individuals are part of reducing cohort of in-Service uniformed engineering professionals, those that remain have less career opportunities as the overall size of Service, Corps and Joint specialists are reduced. Those remaining have a skills fade for lack of opportunity to become experienced in the more demanding levels of equipment maintenance, modification and Urgent Operational Requirements. With less skilled manpower altogether it is difficult for operational Commanders to rely on a short-term surge of output in extremis or to cover any loss of industrial capacity that could arise despite innovative contracting. Smarter contracting is being relied upon to deliver further savings and reforms in Defence support costs and any degradation the 'Intelligent Customer' skills in the negotiations and management of future contracts will prejudice this outcome. Experienced service engineers at all levels are essential for the MOD to discharge its responsibilities robustly in the 'worthiness' Safety Management Chain and this is in danger from the reducing cadre of qualified candidate. If there were more resources available, discharge of the Defence Industrial Strategy would be enhanced by embedding Service engineers in to the key areas of industry.

Overall, for a number of important reasons there is a real chance the required Defence Capability of UK of future commanders in demanding war-fighting environments may not be supported adequately, unreservedly and cost-effectively in the long run. These have, in general, been insidious changes, perhaps unintended consequences of new

ways of working and contracting with Industry. These factors suggest strongly that it is time again for the UK, within the opportunity provided by the Strategic Security & Defence Review, to reconsider these issues and to re-evaluate the contribution of uniformed Service engineers to the Defence Industrial base and to the UK Defence Capability in general.

**The lecture by the Junior Warden-Elect was followed by a lively dialogue.**

Firstly, a comparison was made with London Transport, the RT bus being their last design project. The question was then asked, could not the manufacturers place staff in the armed forces? The Junior Warden-Elect replied that several issues got in the way; insurance, possible injury to staff, and the unclear status of these staff under UN Conventions. (The prominent road haulage contractor Eddie Stobart currently provides logistics services to the military with civilian drivers, as an example). There had been successes in small areas such as heavy transport of armoured vehicles. As it is, the military heavily depend on skilled reservists filling battle roles.

A respondent then stated that no warship currently in service had sufficient technicians on board to repair battle damage. There were decreasing numbers of services technicians generally. This was aligned with the procurement policies of lowest unit technical cost, driven by highly political, and often international, deals. Support costs inexorably rise as a result of the extended service lifetimes of military equipment, leading to pressures in seeking cheaper ways of servicing that equipment. The Junior Warden-Elect answered that there were hopes of future success with the appointment of a 4\* officer to lead the Defence Equipment and Support Organisation, with the expectation that he would put lifecycle planning at the forefront of decision making. However, lifecycle thinking was frequently overridden for short term cost issues. In emergencies, such as the Falklands, procurement for urgent operational requirements (UOR) worked well. Key to this was the assignment of financial authority with military rank. As soon as the crisis passed, the authorities returned to the civil servants, along with stasis. An example was the procurement of Phalanx CIWS – as a UOR, it took weeks; the next time one was required it took 3 years. The key to this is the relationship that HM Government gives to the Treasury to work with the military. The new Government has committed to supporting HM Forces in combat situations. Purse strings have been loosened – urgent requirements are going ahead. It was expected that the Strategic Defence and Security Review would target the simplification of procurement.

There was no question that the Forces had got better at UOR procurement. It was however a double-edged sword. Where standard controls were bypassed for urgency, inherent weaknesses could be built in. An example was given of a wartime emergency Sidewinder Air-to-Air missile installation on a Harrier during the Falklands Conflict when the switch was installed expeditiously with less than the usual level of safety practices and subsequently on the

ground men were severely injured by an inadvertent weapon firing on the airfield at Port Stanley. Another example, which came to roost decades later, was the refuelling system installed in Nimrods for the Falklands conflict. The original Safety Case for this work became inadequate as understanding around As Low As Reasonably Practicable risk management improved. The consequences were seen in the loss of 14 men during operations in Afghanistan, and resulted in severe criticism from the subsequent Inquiry. It is necessary to return on a regular basis to Safety Cases to ensure that they properly reassess the risks.

Following an excellent lunch (perhaps the best steak and kidney pie your Reporter has yet had, together with a splendid trifle), the discussion continued with some passion, probably helped along by the excellent wine. It was generally felt that engineering skills in the Armed Forces were being diluted. The assignment of military staff to roles in their contractors was mooted. There was historical precedence for this. It was accepted that some uniformed staff would probably not return, but this would be the only way that the necessary experience could now be gained.

There was a wide concern that the extensive contracting out of engineering in the Armed Forces, while perhaps satisfactory in a peacetime situation, raised many concerns in a hostile environment. Unsurprisingly, contractor staffs are mostly unwilling to accept combat risks. Service personnel are typically 25% more expensive than their civilian equivalents.

The critical role of the Strategic Defence and Security Review in setting out a sustainable and robust way forward that would protect both Forces and UK plc engineering was accepted by all present as a tipping point. The challenge was how to make the voice of UK engineering and industry heard in time. It was suggested that the Royal Academy of Engineering had a role to play in making Government aware of these concerns. However, it was difficult to discern a commitment for leading the argument at the discussion. In any case the timescale for discussion was very short – the boat may already have been missed.

The effectiveness of contracting was brought up. Did it really deliver value? The example of triservice helicopter maintenance was given as an example of success. Moving to this arrangement had doubled throughput compared to the in-house military organisations. The glacial slowness of military procurement also received attention. Modern weapon systems owed more to Cold War strategy than the multi-threat world we find ourselves. General scorn was heaped on the large aircraft carriers now being built.

The discussion closed with the Senior Warden expressing his thanks to the Junior Warden-elect for a well prepared, stimulating lecture of high quality. The audience joined whole-heartedly in the appreciation and thanks.

*Introduction and summary of the discussion by Paul Wood*

Subsequently arising from the discussions after the lecture it was considered that the Royal Academy of Engineering

## THE ENGINEERING AWARDS

might be asked to undertake a study of all three Services to see if they felt the balance between Service and civilian personnel was optimum. Past Master Rear Admiral David Bawtree wrote to the First Sea Lord with his concerns over the reduction in numbers of experienced RN Engineer Officers in platform and equipment specification, procurement, and support cycles. The official response he received from the First Sea Lord was that, whilst the current RN manning position was not perfect with a focus necessarily being on delivering best effect once back at sea, it was not appropriate for an external review of manning in support functions at this moment.

*Editor*

### AWARDS AND LIVERY DINNER GIBSON HALL, 6th July 2010

This was the first time the company had held an event at the Gibson Hall. The Hall was completed in 1865 for the National Provincial Bank of England who sought to erect 'such a building as may be adequate to the wants of the Bank for many years to come'. The design was entrusted to John Gibson, a son of a Castle Bromwich farmer, who had trained as an architect. In recognition of his many architectural achievements the Royal Institute of British Architects awarded him their Gold Medal in 1890. The Gibson Hall, long regarded as his finest work, now bears his name. Located in the heart of the City of London the most interesting features of the exterior of the Gibson Hall building are the carved panels, set between the columns, and the surmounting statuary. These symbolise the industries and crafts for which finance was supplied. There are groups of statuary over the four pairs of columns and single statues over the five single columns. Notable statues include St George and the Dragon, supported by Britannia holding a wreath and shield bearing the lion's head, representing England and a harpist and miner with his pickaxe representing Wales. Several others represent major provincial cities finishing with one representing the City of London and Old Father Thames.

The Company's dinner was located in one of the main reception rooms, which was the former banking hall, furnished by Devonshire marble columns and gilded domes. The food matched the admirable settings and the L Brass Quintet played beautifully throughout but sometimes drowned out conversation. The Awards Dinner was a great success with many young engineers gaining recognition for outstanding achievements. The Master was assisted in presenting the Awards by the Principal Guest Sir Anthony Cleaver and Senior Officers present. After the Awards the Master proposed the Toast to the Guests and Sir Anthony responded re-iterating the need to support young engineers and maintain training in the profession.

*David Mba*

#### Baroness Platt of Writtle Award

*The Award has been established to recognise engineering excellence amongst those pursuing final year studies leading to the academic qualifications for entry to the Engineering Council's Incorporated Engineer grade. The Award is named after Court Assistant, The Baroness Platt of Writtle CBE FEng in recognition of her work in support of the Engineering profession in general and Incorporated Engineers in particular. The Award consists of a prize, medal and certificate. The Award was made for the first time in 2002 and The Engineers' Company wishes to acknowledge the assistance of the Institution of Engineering and Technology in selecting the Award winner.*

#### **Winner 2010 (Prize £1000) – Christopher Newton**



Christopher Newton is in the final year of a B Eng Motorsport and Powertrain Engineering degree at Coventry University and expected to achieve a first class degree. A very practical young engineer, Christopher has a focused, well planned approach to engineering issues. From an early age he gained mechanical experience on various diverse automotive projects, including the construction

of his own rally car. Often working under extreme time pressure, he displays calmness and assurance, leading teams by example and developing innovative solutions. He is also passionate about using his engineering skills to improve the environment. Having already shown great promise in his work placements while at university, and being driven to succeed in a measured and planned approach, the judging panel see significant potential developing for his career as an engineer.

#### Stephenson Award

*The Award is for those who have been particularly successful in encouraging young people to study engineering with an emphasis, but not exclusively, on mechanical engineering. In 1997, members of the Institution of Mechanical Engineers made donations to fund a Worshipful Company of Engineers Loving Cup to mark the Institution's 150th Anniversary. Donations in excess of those needed for the Loving Cup were used to establish the Stephenson Award and further donations were received from members in later years, supplemented by a substantial grant from Rolls-Royce plc. The Engineers' Company acknowledges the assistance of the Institution of Mechanical Engineers with nominations for this Award.*

**Winner 2010 (Prize £500) – Penny Bunting**



Penny Bunting is the Engineering Coordinator at King Edward VI Grammar school in Chelmsford, Essex, and has established an incredible number of extra-curricular activities focused on promoting engineering as a career. She has been heavily involved in Engineering Development Trust (EDT) schemes, runs two lunchtime Young Engineer clubs and has had significant success in

a large number of science, engineering and technology competitions. Penny has also successfully promoted the Arkwright Scholarship scheme at her school and her students have an excellent record in gaining a range of scholarships towards their engineering degree courses.

**Winner 2010 (Prize £500) – Eur Ing R W Shanks**



Bob Shanks has been Chairman of ‘Imagineering’ since 2001 and has been instrumental in forming nearly 150 Imagineering clubs in schools ranging from Scotland and North-East England to Wales and to the South-West and South-East of England. He has obtained support from many industrial companies including Rolls- Royce Aerospace, Airbus UK, Jaguar Land

Rover, as well as REME and the Royal Navy in establishing ‘Imagineering Fairs’ – one in Warwickshire and another at the Royal Bath and West Show, events which have attracted 180,000 visitors of whom some 40,000 visit the Fairs. Overall, he has been highly successful in encouraging many young people to consider a career in engineering.

**The Fiona & Nicholas Hawley Award for Environmental Engineering**

*The Fiona & Nicholas Hawley Award was established in 2006 and is made annually to recognise excellence in environmental engineering to a resident of the UK, under 30 years of age at the date of submission, who holds a graduate or post graduate degree in engineering or science from a recognised UK university, or who is studying for a post graduate degree at such a university.*

*The Hawley Award is aimed at inspiring younger engineers to present a project that has at least reached prototype stage in meeting three tests of social, economic and environmental sustainability.*

**Winner 2010 (Prize £5000) – Robert Matthews**



For his work on “A novel, electrically independent field incubator to support microbiological water testing in low resource settings”, the Award goes to Robert Matthews of Bristol University’s Water and Health Research Centre. Robert has developed a deceptively simple and genuinely low cost device providing precision temperature control – not a trivial design despite the intended \$20 unit cost. It enables reliable microbiological testing of water sources where electricity supply is unreliable (principally testing for E.coli which is deadly to countless thousands of children annually). It is an essential component of a new testing system in which it provides near constant temperature to enable a water sample in a test capsule (itself a separate and very elegant design) to be subjected to a culture-based test with high confidence.

*Robert’s paper is included on page 19.*

**Water Engineering Award**

*The Water Engineering award is made jointly with the International Water Association (IWA) for the best presentation and paper at the annual IWA UK Young Water Professionals Conference.*

**Winner 2010 (Medal) Doug Aitken**



Doug Aitken was educated at Kirkcudbright Academy and gained an M Eng degree in Civil and Environmental Engineering at Edinburgh University. During his time there he was Project Leader for the University’s branch of “Engineers Without Borders” and successfully managed a project to design and install a renewable energy supply for an orphanage in Cambodia. He is now undertaking postgraduate study. The Award is made

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for his paper: “Algae: A solution to wastewater treatment, greenhouse gas emissions and biofuel production?” which discussed the potential for an integrated solution to wastewater treatment and greenhouse gas emission mitigation in order to increase algal biomass production and thus biofuel production and other added value products.

### **Mercia Award**

*The Award is made annually to a student under 30 and provides a medal and bursary towards the cost of a taught or research programme of postgraduate studies in Medical Engineering.*

#### **Winner 2010 (Medal) Jonathan Noble**



Jonathan Noble was educated at Queen Elizabeth's Hospital School in Bristol and gained an Honours degree in Physics and an Advanced Engineering MSc at Warwick University. He is currently training as a Clinical Scientist at King's College Hospital, and studying part time for an MSc in Medical Engineering and Physics. In his spare time he has been an instructor for the

British Weightlifting Association and also a silver medallist at the Indoor Rowing Championships. Jonathan's paper was based on his research into the potential of Magnetic Resonance Imaging (MRI) for measuring muscle tissue properties in patients with Cerebral Palsy. This could potentially provide an effective, non-invasive, muscle assessment method to enhance treatment for patients who are often young children.

### **Cadzow Smith Award**

*Established in 1996, the Cadzow Smith Engineering Awards were endowed by the Eastern Group plc in recognition of the outstanding services to engineering of its former Chairman, Dr. James C Smith CBE FREng FRSE and now a Past Master. The Awards are for excellence on an accredited undergraduate engineering course conducted at one of the eleven universities within London and the Home Counties. Besides academic excellence, the recipients of the Awards must have demonstrated self-confidence, professional awareness, leadership and sound common sense.*

#### **Winner 2010 (Prize £2500) – Mr Joe Gleeson, Imperial College London**

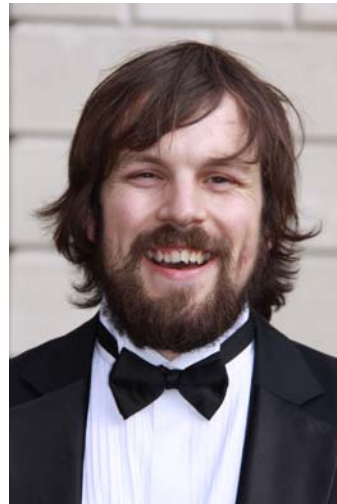
An able and visionary final year MEng undergraduate in Materials Science and Engineering, Joe Gleeson impressed with his focused personal ambition and deep conviction of

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the crucial importance of innovative engineering in the creation of a sustainable world. With evident management and leadership potential, he has a strong belief in the major potential contribution of his chosen automotive sector to carbon reduction, energy efficiency and sustainable manufacturing. This, together with his demonstrable academic, teamwork and sporting achievements as an undergraduate, singled Joe out as a future engineering high-flyer and a worthy winner of the award.



#### **Special Commendation (£500) – Mr Sean Canty, City University London**



Sean Canty is nominated for a Special Commendation because from a strong field of candidates, he stood out for his determination, focus and achievement. Having already passed through the NVQ route, achieving Apprentice of the Year, he is now on track for a First Class Honours M Eng in Automotive Motorsport Engineering which included a successful industry placement with

Rolls-Royce. On the way he has already garnered a number of awards and in 2009 led City University's Formula Student team to a place on the grid. A natural team player and leader, this commendation shows recognition of Sean's clear potential for future success in the engineering profession.

## **THE SERVICES ENGINEERING AWARDS**

### **The Services Engineering Undergraduate Award**

*Awarded to an officer graduating from the Defence Technical Undergraduate Scheme (DTUS) who has achieved outstanding academic performance and demonstrated clear leadership and commitment to a professional engineering career in the Armed Forces.*

**Flying Officer Fiona Taylor RAF** was an Officer Cadet with Trojan Squadron (DTUS) at Newcastle University. An

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excellent academic role model, she involved herself wholeheartedly in DTUS activities, thriving in the lead and organisational roles. She represented Newcastle University at hockey. As Trojan Squadron's team leader for the 40-mile Keswick to Barrow race she was the Individual Ladies winner and, to support 'Help for Heroes', she led the winning mixed team in the Sheffield "Hog Dash" off-road challenge. She graduated in June 2009 with a First Class Masters degree in Mechanical Engineering. As well as amply showing her leadership potential, Flying Officer Taylor is enthusiastically committed to an engineering career and is presently completing her Engineering Officer training at RAF College Cranwell.

*Flying Officer Taylor was unfortunately on duty elsewhere.*

### **The Services Engineering Postgraduate Award**

*Awarded to an officer completing a postgraduate technical degree who has achieved overall academic excellence and contributed most to the advancement of technical knowledge or its application through a research project.*

**Major John Wilson RE** graduated from the Royal Engineers Professional Engineer Training course in July 2009. First placed of 11, he stood out from his peers, gained early Chartered Engineer status with IET, and won both the course prize and the Rainey Anderson prize for the best thesis – a study of investment in CHP to improve building environmental performance. On his commercial attachment, he was plucked quickly from project engineer to



lead a delayed £25M M&E project for Melbourne's International Airport extension and personally brought the project back on track. He also designed the control methodology for the 500m Qatar National Bank tower in Doha and a £50M HV distribution system for Melbourne Airport. Recently at Camp Bastion in Afghanistan, he has used his new skills and Chartered status to clear effect, with overall responsibility for the design of a US\$13.5M air traffic control complex intended to handle more air movements than Luton Airport. Major Wilson is a dynamic, inspirational leader and outstanding engineer who has delivered well above his, then, Captain rank.

*Both these Awards were made on the recommendation of the Defence College of Management and Technology at Shrivenham, Wilts.*

### **The Services Engineering Training Awards**

*Awarded to a Warrant Officer or Senior Rating / Non Commissioned Officer of each of the three Services for*

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*outstanding achievement in initial or continuing engineering training, measured through leadership and the professional inspiration given to others.*

*Nominations are invited from: Defence College of Electro-Mechanical Engineering, HMS SULTAN; Maritime Warfare School, HMS COLLINGWOOD; Defence College of Communications and Information Systems; The Royal School of Military Engineering and Defence College of Aeronautical Engineering. Winners are selected against the criteria by The Services' Awards Panel of The Worshipful Company of Engineers.*

### **Royal Navy Award**

**Petty Officer Marine Engineering Mechanic (Electrical) Allan Davis** has provided electrical training to Engineer



Training Initial Career Courses since July 2008; his experience, highest standards and enduring enthusiasm make him an inspirational character to both trainees and staff. He is frequently involved in voluntary work to update, repair and improve training methods to ensure trainees receive the best possible service. Taking pride in his work, he is a driving force in the delivery of training to the next generation of Engineer Technicians.

Selfless dedication and a passion for trainee development make POMEM(L) Davis an outstanding asset to the Royal Naval School of Marine Engineering and the Royal Navy.

### **Army Award**

**Warrant Officer Class 2 (QMSI) Dean Ross** joined the



Army in 1990 and attained his Clerk of Works (Construction) qualification in 2002. Whilst with the Royal Engineer Force Protection Engineering (FPE) Cell he was instrumental in the development of the Elevated Sangar whose safe, simple and fast construction is now considered best practice; the equipment is used extensively by the Corps in Afghanistan. He was selected in 2009 to the

teaching Staff at the Royal School of Military Engineering Professional Engineer Wing as the sole non-commissioned

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Assistant Instructor (Planning). With his senior line manager deployed in Afghanistan he has led the department and shouldered the full responsibility for developing, whilst delivering, Project Management training. He draws on his exceptional experience to improve both the courses on which he teaches and in the FPE area outside his formal remit. He is outstandingly enthusiastic and professional in his instruction, an inspirational leader and he displays an endless zest for improvement of his students.

### **Royal Air Force Award**

**Warrant Officer John Rich** RAF is the adjutant on



Aerosystems Training Wing in Number One School of Technical Training, Royal Air Force Cosford. The Wing is responsible for delivering technical training to the mechanics, technicians and future engineer officers in all the aircraft trades. WO Rich has been the focal-point of a project to increase the capacity of the Wing to cope with a surge in recruiting, which had resulted in a more than 200% increase in the

number of trainees at Cosford. This has required careful planning and staff training and, through his diligence and hard work, WO Rich has been instrumental in ensuring that this new training capacity has remained compliant in all respects with the contemporary engineering practices in the RAF, preparing the young men and women who pass through training at Cosford to be ready to take their place in the current operational climate as quickly as possible.

### **The Services Operational Engineering Awards**

*Awarded to an officer, from various Service and Corps areas, who has best made the application of professional engineering judgement or technical innovation to contribute significantly to the maintenance or enhancement of operational capability or effectiveness in any theatre of operations, including the UK. Recommendations for the Operational Awards are made by the Senior Specialist Services Authority appropriate.*

#### **Royal Navy Operational Engineering Award**

*(Called the "Thunderer" award to sustain the heritage of this name within*

*The Worshipful Company of Engineers)*

**Lt Cdr Nick Bowser RN** served as the Air Engineering lead for the preparation and deployment of the Sea King Mk7 for Operation HERRICK (UK operations in Afghanistan) in 2009. He planned the equipment, manpower and engineering training elements of the deployment. He worked closely with the Force Commander

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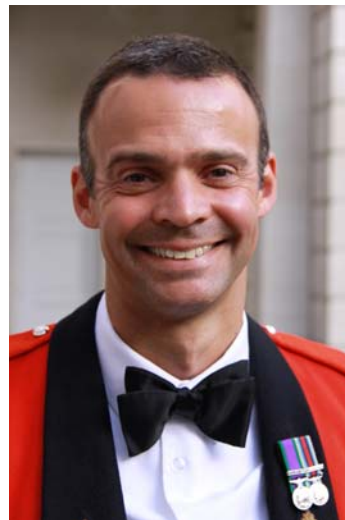
and capability sponsor to determine the requisite Theatre Entry Standard modifications, engaged with the Sea King



project and in-service engineers to oversee the modification of the aircraft and became involved with the Release to Service desks to deliver the requisite operational clearances. He determined the size of the deployable and non-deployable Sea King Force and worked closely with the Branch Manager leading to a Force Uplift of 49 people. To ensure that all the planned support elements were

delivered at the right time and at the right level he deployed to theatre and had to overcome a particularly challenging spate of transmitter failures.

### **Royal Engineers Operational Engineering Award**



**Major Iain Brown RE** took command of 518 Specialist Team Royal Engineers in August 2009 and deployed to Afghanistan. His role was to develop the Afghan construction industry across Helmand Province. In six months Major Brown's team let contracts totalling \$35M to Afghan contractors for construction to support economic development, security and stability. He used his engineering skills to develop solutions

matched to Afghan construction skills. He implemented training for construction companies and encouraged business development. He introduced innovative, sustainable and economic engineering solutions including solar lighting. His leadership, engineering skills and judgement made a major contribution to the campaign.

### **Royal Electrical & Mechanical Engineers Operational Engineering Award**

**Captain Phil Noke REME** was the Battalion Technical (Operations) Officer during Operation HERRICK10 in Afghanistan. By developing the operational engineering competence and standards, he has demonstrated an informed and exceptional commitment to improving the professional standing of the Corps whilst on operations. In a relentless and agile pursuit of engineering excellence, Captain Noke was pivotal in uniting the engineering strengths of the

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military and civilian contractor with those of the locally employed civilians. His approach and actions ensured the



success of the campaign, and his resourcefulness led to a positive impact on the operational capability of the UK Forces in Afghanistan. Captain Noke is a highly professional technical officer with the foresight, creativity and imagination, to deliver exceptional results based on his commitment and widest professional mastery of engineering and related activities.

### **Royal Air Force Operational Engineering Award**

As leader of the Expeditionary Chinook Engineering Squadron, **Squadron Leader Gareth Bryant's** leadership



of a fundamental transformation of engineering support to Chinook operations, underpinned by exceptional engineering judgement, has been central to a 50% increase in the annual Chinook flying rate, whilst also successfully introducing the Chinook Mk3 into service. His outstanding leadership of the engineering team enabled the Chinook Force to deliver a battle-winning

capability, worldwide. He overcame considerable technical challenges in maintaining aircraft in harsh operational environments and mentored a team that proved itself under enormous operational pressures as well as enemy fire. He is an outstanding engineer in the finest traditions of the Royal Air Force.

### **The Services Engineering Support Award**

*Awarded to a serviceman who has contributed most, through the application of engineering skills including the use of leadership, management and technical acumen to meet materiel availability targets for any of the Armed Forces. The recipient would normally be chosen from the Defence Equipment & Support Organisation from a recommendation by the Chief of Defence Materiel.*

**Colonel Nicholas Wills** has led the Protected Mobility Team in the DE&S at MOD Abbey Wood for the delivery of vehicles to UK forces on operations. On taking over, he

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rapidly shaped the new team and drew the best from its members' diverse skills and experience. Faced with a continuously evolving threat, he took the lead in working with industrial suppliers to introduce innovative solutions. Vehicles for different roles were delivered at a rate exceeding 50 per month throughout the year. He, together with his Team, has been completely committed, working long hours to drive programmes to up-armour and integrate



these platforms. There is absolutely no doubt that his efforts with his Team have resulted in the saving of many lives on recent operations.

## **The Master's Speech**

Prime Warden, Masters, Ladies and Gentlemen

Welcome to Gibson Hall, an unusual venue, not a Livery Hall, but within the City. This building was built in 1865 as the Head Office of the National Provincial Bank. You may remember that National Provincial merged with the Westminster Bank some decades ago, to form the National Westminster Bank. (Nat West) That in turn was taken over by the Royal Bank of Scotland (RBS) – and we all know where that led us! So, the saga continues.

This is a Grade 2 Listed Building, and a splendid venue for our Awards Dinner. This main hall was one of the Cities greatest banking halls. The latter half of the Victorian period was a time when companies built Offices to express the power of the organisation and the ego of their Directors – as happened with Town Halls and Civic buildings. Nowadays it is the opposite – as low profile and low cost as possible and never buy if you can lease, keep it flexible. Oft said in the City, if a company builds a prestigious office, sell the shares!

Please join me in thanking our caterers for an excellent dinner and our musicians, the Connecting Arts Brass Quintet for their continuing high standard.

The presentation of our Awards is a major highlight of the year.

Not that our Liverymen need reminding, but key objectives of our Company are – I quote – “to promote the science, art and practice engineering for the public benefit” and, to “...to support and encourage standards of excellence in the profession of engineering”. It is one of the greatest pleasures of our succession of Masters to be able to honour and congratulate such talented and dedicated people. With people like you, our future is in good hands!



The cost of our Awards comes from the result of dedicated Liverymen, both now and in the past, giving generously to our Charitable Fund and persuading others to do the same. Many Liverymen have given generously of their time to judge entries, promote Awards and administer the process. I thank you all.

But we are here to honour the Award winners, not ourselves.



I always get inspiration from reading Citations and meeting Award winners. You are all doing great things in your various fields. We read so many negative things in the press – who no longer believe good news is worth printing. But you are prime examples to all of us of the great things being achieved by many.

A particular mention of Awards goes to members of the Forces. Some are not here today because of

service in Afghanistan. I am always hugely impressed by the resourcefulness and “get it done” attitude of the services – and at this time of all the issues to do with Afghanistan, we particularly honour you!

Among our guests this evening we are very pleased to welcome from other Livery Companies, the Prime Warden of the Shipwrights, and the Masters of the Glaziers and Painters of Glass, Carmen, Guild of Air Pilots and Air Navigators, Marketors, Lightmongers, Information Technologists, Wheelwrights and the Guild of Educators.

Also, among our Company guests, we welcome the supporters of our award winners, including high ranking officers from each branch of the services. We also welcome the Chief Executives of the Institution of Mechanical Engineers, the Institution of Chemical Engineers, the Society of Environmental Engineers, the Arkwright Trust, the representative of the Chief Royal Engineer and the Resident Governor of the Tower of London.

I am particularly pleased to welcome Sir Anthony Cleaver, accompanied by his wife Jenny, as our Principle Guest. Tony and I go back a long way. I first knew him 20 years ago when he joined Smith & Nephew as a Non-Executive Director and I was Chief Executive. Those were the days when we were all striving to introduce good Governance practices after some of the abuses and scandals of the 1980’s, which lead to the Combined Code. Non-executives with real influence were new bread in most companies. Tony was an outstanding non-executive always focussing on the big strategic issues. He led national debate by chairing the RSA’s study on Tomorrows Companies, which had a major influence. His major career was in IBM, latterly as

Chairman and Chief Executive of IBMUK. He has been Chairman of several Companies, Birkbeck College and the Royal College of Music, and numerous other bodies. I could go on His CV takes 5 column inches in Who’s Who. A man of huge energy and breadth. Today he is here as Chairman of Engineering UK (previously the Engineering and Technology Board). Tony has brought his huge skills, along with leaders of the Royal Academy of Engineering and the Institutions, to create the spirit of cooperation and working together which now generally exists. We only have significant influence as a profession by being united with common and complementary messages

Finally, I welcome all our Liverymen, and all your personal guests

Would members of the Engineers Company please join me in the Toast to our Guests.

### **Sir Anthony Cleaver’s Speech**

Master, Wardens, Ladies and Gentlemen

I was delighted when your Master asked if I would reply on behalf of the guests for two reasons. Not of course, because I would have to sing for my supper – there can be very few people who honestly look forward to that moment when the Beadle says “Are you ready to speak now, Sir Anthony, or shall we let them enjoy themselves a little longer?” And can I also now apologise for any repetition to the ten people who were also present when I spoke to the Scientific Instrument Makers three weeks ago – well make that 9 as I’m told that at least 10% of one’s audience tend to be dozing.



My first reason was simply that, knowing your Master and several of his predecessors, I was sure that I would be thanking the Company, on behalf of all the guests, for a truly splendid occasion – I am sure you will agree we have been royally wined and dined.

But my second, and rather more important, reason was to be able to thank the Company publicly for the support

it gives to engineers and particularly young engineers during their formative years. One of my first meetings when I became Chairman of what is now Engineering UK, nearly three years ago, was with David Sainsbury who had just recommended in his paper “Race to the Top” that there should be a National Science Competition – I agreed and we set off to create the first Big Bang Fair. Our first Fair, in March last year, saw over 5,000 youngsters attend the event in London’s QEII Centre and the first UK Young Scientist and UK Young Engineer were chosen. Building on that,

## *The Swordsman*

this year's event took place in Manchester where 110 organisations, from right across the science and engineering spectrum, from leading companies to government departments, from the Royal Society to the major engineering institutions to the BBC, came together to provide over 15,000 young people with an exciting window on the worlds of science and engineering and the opportunities for truly satisfying careers. Perhaps equally important, the Fair was attended by over 4,000 of the key influencers, parents, teachers and careers advisers.

By the end of next week, Regional Fairs will have taken place in all the UK regions and nations and next March, we will be bringing the Big Bang Fair back to London to the ExCeL Centre – it will, I intend, be even bigger and better.

But an event like this can only start a child on the journey. To capitalise on it, we need to provide opportunities for students to learn about engineering in a practical way, which is why our other major initiative, Tomorrow's Engineers, has brought together five of the leading schemes that provide enhancement and enrichment activities, such as Young Engineers' after school clubs. Tomorrow's Engineers has already taken these activities to over 30,000 youngsters this school year, in addition to the thousands those schemes were already engaging. Again, this programme will grow next year and should be able to reach over 100,000 a year before long.

So where next? Well, it's important to be very clear what you wish for – a point well illustrated by the young woman who was recently walking through Charing Cross station when she saw a man playing the violin. So enchanted was she by his virtuosity that she put a £20 note in his cap. As she made to walk off, he stopped her and said "Madam, that was very generous". "Not at all", she said, "I thought your playing was magical." "Well", he said, "I am actually a magician and I would like to grant you 3 wishes." "Really?" she said. "Yes", he replied, "the only condition is that whatever you receive your husband will have ten times over." "Well, first," she said, "I would like to be beautiful." "You shall", he said, "and your husband will be exceedingly handsome." "And then, I would like to be wealthy." "Of course, and your husband will become one of the wealthiest men in the country." "And then", she said, and a small smile played around her lips, "I would like a mild heart attack."

So what are my three wishes? First, that the collaboration we have begun across the engineering community will continue and grow so that every child has the opportunity to understand what engineering really is and what opportunities it could offer. Second, that we use our combined voice to accentuate the positive. For example, how much play have we made of the fact that in the recent Times Review of Universities in the top ten salaries for new graduates, Chemical Engineering came third, General Engineering fifth, and Civil and Mechanical Engineering ninth and tenth.

My second wish is very specific - that government give wholehearted support to the Engineering Diploma – it is

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already popular, it has brought education and industry together to deliver it and is the only place where engineering appears in the curriculum.

And third is that government understand that to turn the rhetoric of "less financial engineering and more real engineering" into reality and maintain our position as the world's 6<sup>th</sup> largest manufacturer, it must support engineering. And this does not, at least in my view, mean more financial support but simply building on what we have and strongly endorsing our growing collaborations, rather than creating new initiatives. Our progress so far has shown that presented with well-managed and properly evaluated programmes, Industry and the institutions are perfectly willing to provide the necessary support. Properly measured programmes with government endorsement can do far more than centrally dreamed up publicity campaigns.

Ladies and Gentlemen, many years ago I was told that there are only three rules for a speaker – stand up to be seen, speak up to be heard and shut up to be popular.

So will you please now join me in a toast – the Worshipful Company of Engineers, may it flourish root and branch for ever.

## **ARKWRIGHT SCHOLAR 2010**

The Master and Court Assistant Peter Blair Fish attended the presentation ceremony for 264 new Arkwright Scholars for 2010 on 29th October at the Institution for Engineering and Technology. The awards exist to promote the career of engineering for pupils in their last two years at school and are enjoying considerable success in this endeavour.



Our scholar this year is Sarah Laughlin shown here with the Master John Robinson and Peter Blair Fish. Sarah is a pupil at Colfe's School in South London and is hoping to study Physics or Engineering at Imperial College.

*Editor*

## THE FIONA AND NICHOLAS HAWLEY AWARD 2010

### A low cost incubator to support microbiological analysis in developing countries

**By Robert Matthews, supervised by Stephen Gundry**

Water and Health Research Centre, University of Bristol

**Background**

The idea for a phase change incubator originated from the Aquatest project ([www.bristol.ac.uk/aquatest](http://www.bristol.ac.uk/aquatest)), the goal of which is to develop a new, low cost, easy to use field test to monitor microbiological contamination of drinking water. The Aquatest device detects *Escherichia coli*, an indicator of faecal contamination in water (WHO, 2004). Aquatest has the potential to bring substantial benefits to developing countries; governments and regulatory bodies will be able to conduct a much higher volume of testing than at present and communities and individuals will be empowered to conduct their own testing programmes.

The Aquatest device is completely self-contained; it can be used by relatively unskilled hands and in field settings. However, as with most microbiological tests, it requires a period of incubation at a controlled temperature. This is a problem in a low resource setting not only because the capital cost of a conventional incubator is often prohibitively high, but the unreliable power supply that is endemic across most low resource areas means that a typical electrical incubator will not function correctly (Sanghvi, 1991). Only a relatively few better equipped laboratories with backup power supplies can achieve reliable incubation. To address this problem, a low cost phase change incubator that does not require an electrical power supply has been developed. Although the phase change incubator has been designed with microbiological water testing in mind, in particular in conjunction with Aquatest, it has potential to be applied to many other fields, including clinical microbiology, environmental monitoring and sample transport.

**The Phase Change Incubator**

The phase change incubator (Figure 1) makes use of the combination of a vacuum flask to provide a high level of insulation and a phase change material (PCM) to store energy in the form of latent heat. To use the incubator, the incubation chamber is filled with 500ml boiling water. Energy is transferred from the water to the PCM, causing it to melt. This takes a minimum of 30 minutes but the incubator can be left in the filled state for up to 6 hours without excessive heat loss to the environment. It is envisaged that the tester will fill the incubator before setting out to conduct the test. When the test is ready, the water can be emptied and the test inserted, which will then be kept at incubation temperature for 24 hours. Design criteria for the phase change incubator are shown in table 1:

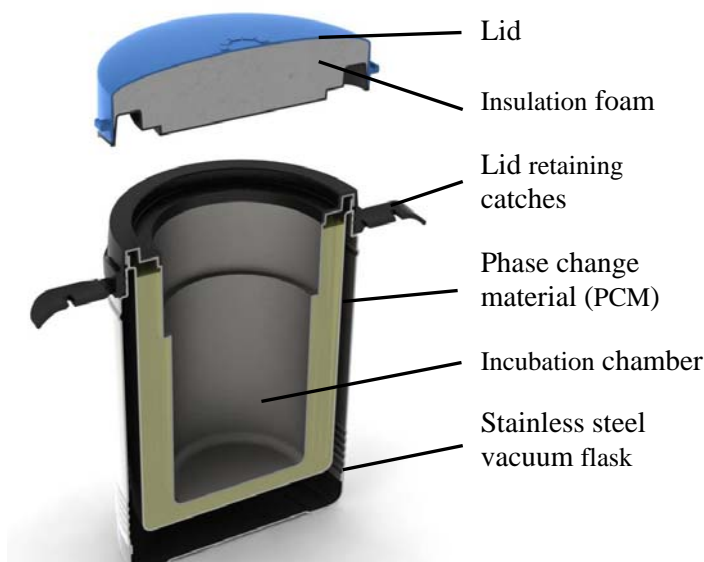


Figure 1: The components of the phase change material incubator

Technically capable	Heat a 100ml water test to incubation temperature within 1hr Incubation temperature to be maintained for 24hrs Temperature of test must not exceed <i>E. coli</i> growth temperature
Reliable operation	Independent from unreliable resources, especially mains electricity In a wide ambient temperature range, proposed 10°C to 40°C Outdoors, in-home, in-vehicle, in-laboratory
Affordable	Target less than \$20
Ease of use	Suitable for use by unskilled operators Intuitive operation by design Low maintenance
Portable	Can be easily carried by one person
Rugged	Resistant to harsh operating environment Misuse and forceful operation

Table 1: Design criteria for the phase change incubator

**Incubation Temperature**

*E. coli* tests are commonly used worldwide, but discrepancies in protocol exist when it comes to incubation temperature. For example in the UK and much of Europe it is standard practise to incubate at 37°C ± 1°C whereas in the US the regulations state 35°C ± 0.5°C (Standing Committee of Analysts, 2009, APHA, 2005). Detail of the incubation temperature is not of great concern

when a standard laboratory incubator is used, although many are not accurate to 0.5°C. However, a less stringent incubation temperature requirement has significant potential benefits for the phase change incubator, as less energy storage requires less PCM, leading to reduced size and cost of the incubator. To this extent, a significant part of the development of the phase change incubator has been establishing exact incubation temperature requirements for an *E. coli* test, thereby defining a performance envelope for the phase change incubator.

*E. coli* in the natural environment may be subject to stress due to conditions such as low temperatures, exposure to oxidising agents (such as chlorine) and nutrient deprivation. It is important for an *E. coli* test to recover injured organisms to ensure that they are detected; as these are more sensitive to incubation temperature than healthy *E. coli*, this will determine the temperature requirement of the phase change incubator.

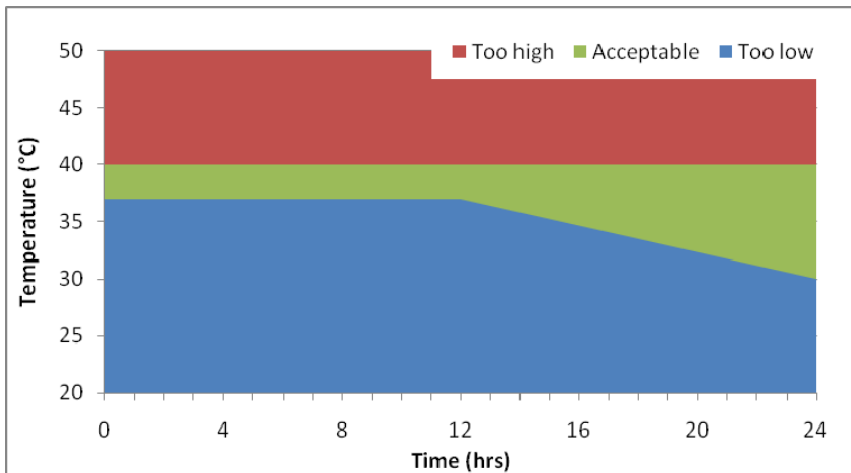


Figure 2: Incubation temperature range that does not affect the recovery of chlorine injured *E. coli*

Figure 2 shows the acceptable incubation temperature range determined for the recovery of chlorine injured *E. coli*. Using these data, the performance of the phase change incubator can be demonstrated. The prototype incubator has been tested for its ability to keep warm a 100ml water sample in a range of simulated conditions. These include hot, cold and fluctuating ambient temperature, cold sample starting temperature and different lengths of charging time. Examples of response to challenging ambient temperatures are given in figures 3 and 4.

Unlike a conventional incubator, the performance of the phase change device is dependant on the ambient temperature, because the amount of energy stored within the system is fixed. However, also unlike a conventional incubator, it has the ability to protect the sample against excessive high temperature spikes.

**Further Research**

To date, the incubator has been developed primarily for microbiological water testing. To support trials of the Aquatest device, an initial batch of 1000 is due to be produced for field testing next year. Application of the phase change incubator concept to clinical microbiology or other fields still needs investigation to establish user and technical requirements for specific tests, as described above for an *E. coli* test. This work is currently in the planning stage and is due to start, with the assistance of the Fiona and Nicholas Hawley Environmental Engineering Award, in 2011.

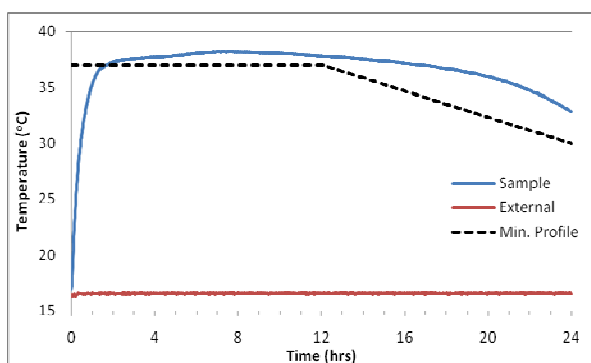


Figure 3: Performance of the phase change incubator in a cold environment with reference to minimum acceptable temperature profile

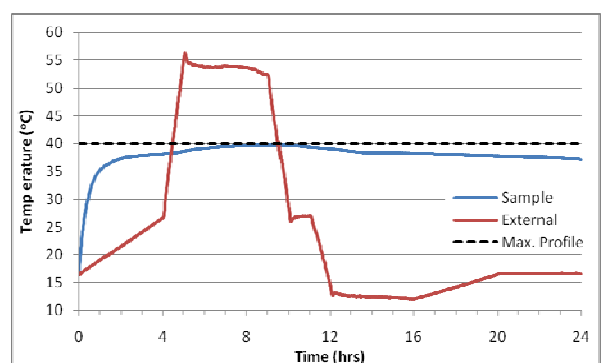


Figure 4: Acceptability of the incubator to protect against spikes in ambient temperature with reference to maximum acceptable temperature profile.

**Acknowledgement of Funding**

This work was funded by the Bill and Melinda Gates Foundation as part of the Aquatest 2 project.

**References:-** APHA (2005) Standard Methods for the Examination of Water and Wastewater, Washington DC. SANGHI A.P (1991) Power Shortages in Developing Countries- Impacts and policy implications. STANDING CTTEE OF ANALYSISTS (2009) The Microbiology of Drinking Water- Part 4. WHO (2004) Guidelines for Drinking Water Quality

# THE FIONA AND NICHOLAS HAWLEY AWARD 2009 One Year On

Helen Bailey was the winner of the Fiona and Nicholas Hawley Award in 2009 for her work on the use of used vegetable oil (UVO) in asphalt, developing a solution (Vegetex) using UVO to achieve the same key properties as bitumen, beneficially exploiting a waste material without loss of performance in the asphalt.

Since winning the Hawley Award in July 2009, Helen and Aggregate Industries have laid the first live road trial of a Vegetex mixture, taking place on the 20<sup>th</sup> of October 2009. The materials both Vegetex and a control were manufactured to an AC 10 close surf 70/100 and were produced at Express Asphalt, Newark, and laid on New Road, Clifton, Bedfordshire. Hauling time was approximately 120 minutes. The materials were laid 40mm thick using a conventional asphalt paver. The laying and compaction of the Vegetex material is shown in figures 1 and 2 respectively.

differing speeds at which materials were laid. This was caused by unprecedented media presence on site which hindered the laying of the material. However, when assessed by the gyratory compaction in the laboratory the material was shown to have similar workability to the control material. The trial also showed that Vegetex material ages significantly less (20%) than the control material. This is a positive result and will enhance the long term performance and durability of the asphalt composites. As expected, no difference was observed between the two mixtures in terms of texture depth and surface regularity.

As a follow up, a visual assessment of the site was made 6 months after laying, figures 3 and 4 show the site to be in good condition with no evidence of deterioration. Additional laboratory work will commence 12 months after laying.



Fig 1:- Laying of AC10 close surf Vegetex 85



Fig 2:- Compacted AC10 close surf Vegetex 85

Results of the trial were encouraging although it was not possible to compare on site the compaction of Vegetex material with the compaction of the control material due to



Fig.3:- Vegetex material, New Road approach to the village.



Fig 4:- Vegetex material, New Road leaving the village.

In addition to winning the Hawley Award, the project was also shortlisted for the Institution of Engineering and Technology (IET) Innovation Awards (Sustainability) later the same year where it was highly commended. The work has since been published in both UK and US patents and Vegetex is a trademark registered product name for Aggregate Industries. More recently, Helen submitted her PhD thesis on the subject and is currently waiting for the examination. Helen's current research now focuses on developing cost effective, practical solutions for industries producing environmental pollutants, delivering innovative,

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workable and operational solutions for the disposal or remediation of harmful chemical wastes. An area of this work, the use of enzyme technology to remediate tar plantings, has been shortlisted for the 2010 Institution of Engineering and Technology Innovation Awards (Sustainability)

## **VISIT TO IMPERIAL COLLEGE, 7 July 2010**

A group of about 20 Members and Guests assembled at Imperial College for a dual visit to the Centre of Synthetic Biology and Innovation and the Smart Energy Laboratory Division of the Energy Futures Laboratory. Members and Guests were split into two groups for an hour in each of the respective Centres. The visit was co-ordinated by Liveryman Professor Richard Kitney assisted by his colleague Professor Paul Freemont to both of whom go our grateful thanks.

### **Centre for Synthetic Biology and Innovation**

The Centre is at a relatively early stage of a five year research program funded by an EPSRC Science and Innovation award that aims to support new research activities in areas of national strategic importance. The Centre is both multidisciplinary and multifaculty; is based in the Faculty of Engineering and works closely with the Departments of Bioengineering and Life Sciences.

Professor Freemont gave an introductory talk which set the perspective for the more detailed presentations that followed. This started by contrasting the dimensions of major engineering artefacts with those that apply to biological systems typically nanometric, Angstrom and ultimately biological cell related scales. The essential function of DNA in its capacity of long term storage of codified genetic instructions which influence the development of all known living organisms was explained, and coupled to a description of the intercellular process by which DNA interacts with an RNA intermediary to promote protein synthesis.

Professor Freemont concluded his introductory talk by explaining how the biological information in a genome as encoded in its DNA may be used as a measure of biological complexity. As an example a comparative table indicated the genome difference between bacterial and human life forms.

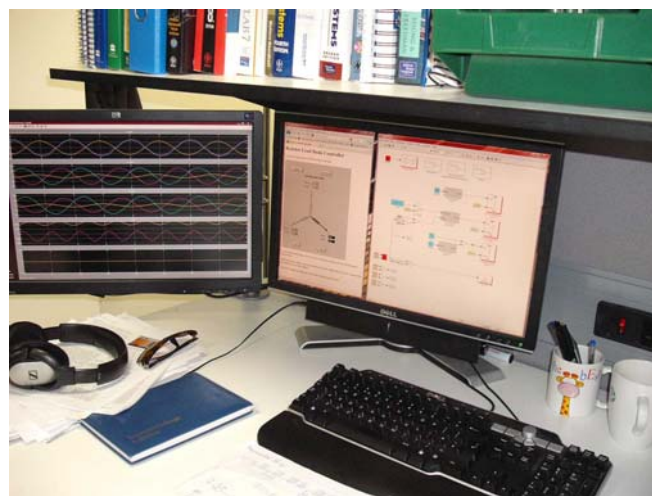
Professor Kitney then explained the procedure by which a cell, typically a bacterial cell, can be created from a naturally occurring cell by reconstructing its DNA using biochemical methods. Such cells will have their own working characteristics and may be used in combination with other similarly constructed cells to form 'parts' and thence 'devices' (human defined functions) and ultimately systems which meet specified requirements. Such progressions are analogous to conventional systems

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engineering. The scope of application is very broad typically ranging over biofuels, complex drugs, simple control mechanisms, computing and biosensors.

Such is the global interest in Synthetic Biology that it has proved desirable to establish recognised standards for DNA synthesised products. Thus the trademarked designation 'BioBrick' has come into being. This refers to a specific 'brand' of open sourced genetic parts subject to acceptance by an open technical standards setting process headed up by The Biobricks Foundation. This is in turn supported by a Registry of Standard Biological Parts maintained at the Massachusetts Institute of Technology. To-date several thousand Biobrick parts are registered.

Professor Kitney's presentation was then complemented by two further presentations by other staff members of the Synthetic Biology Centre. The first of these looked forward to new levels of sophistication in synthetic biological application and stressed the need for a unified framework for synthetic modular design. This placed an emphasis on the need for predictive composable models to assist the creation of systems from genetic parts, allied to the production of working design tools necessary to support a synthetic biological equivalent of C.A.D. The second described the use of a synthetic biology device which acts as a sensor for the detection of a surface infection and by monitoring its progress gives early warning of any tendency for the infection to spread.



*Computer Based Work Station*

It is well recognised that the artificial manipulation of living cells gives rise to a range of societal and ethical issues. For this reason a team from the London School of Economics which specialises in the social, economic and ethical dimensions of synthetic biology works in parallel with Centre staff from the outset of research projects and addresses concerns of policy and regulation.

This part of the visit concluded with a brief visit to the so called 'Wet Labs' to observe ongoing experiments.

### **The Smart Energy Laboratory**

The Smart Energy Laboratory opened in June 2009 and is funded by a bequest from Maurice Hancock a former

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alumnus and Senior Lecturer at Imperial. The Laboratory provides facilities that enable students and researchers to explore how smarter forms of control and co-ordination will enable the energy systems of the future to match low-carbon energy generation to the needs of customers. The laboratory is serviced by an energy supply from the national grid which passes through banks of inverters to form viable supplies for a range of electrical experiments. These include the simulated creation of grid networks. These enable methods of control and operation to be investigated and thereby promote a better understanding of how new technologies affect grid operation and its response to postulated situations. This includes integrating energy systems to include offshore renewable supplies. Such network analysis is supported by mathematical modelling.

Demonstrations were given which indicated how grid responses may be evaluated and displayed on computer screens at dedicated work stations. That shown above is typical. These included a study of how a load bearing system reacts to the imposition of a specifically located fault, and how the nature and location of the fault may be determined.

The visit was rounded off with an informal reception which was a fitting end to a most instructive and inspirational event.

*Peter Chapman*

## **GOLF CHAMPIONSHIP THE WELCOMBE, STRATFORD ON AVON 25th -26th July 2010**

After a few scares with the difference between the Master's 24 hour clock and British Summer Time, a full complement of golfers mustered somewhere near a first tee at Noon on Sunday 25<sup>th</sup> July. The venue was



Welcombe, on the outskirts of Stratford on Avon and the only use for a golf umbrella would have been to double as a parasol. The Sunday was essentially a practice round competing in teams of three, and the casual conversation before the start seemed to be a good natured competition between those making their apologies for a lack of golfing prowess and those ready to question the authenticity of the various claimed handicaps.

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Welcombe is quite a hilly course (as in what passes for mountainous in Warwickshire) and various forms of propulsion for people and golf clubs were adopted. But one way or another, golfers of a good and normal standard got round in time for an excellent dinner. The Master, of course and of the Course, presided and, having played with Ruth Rooley and Andrew Cullimore, was able to award his own team the first prize after winning by a well deserved country mile.



*The winning Sunday Team, the Master, John Robinson, Ruth Rooley and Andrew Cullimore*

The serious individual competition got underway at 10 o'clock on Monday morning and, after the nerves of Sunday, this time the pre-golf conversation was relaxed. The course, which was in pretty good condition, had benefited from early morning attention by the green keepers and many of us paid them the compliment of checking out their work in the numerous bunkers and by getting full value for money on the greens. The prizes, even for those familiar with golf days, were quite complicated and nobody seemed ready to claim the one set aside for 'The Shortest Drive from the 1<sup>st</sup>' (*that was me. Ed*) and the Master was careful not to insist on a formal presentation. In the real thing, the Lady Winner was Patricia Huffell with 32 points, in a round put together with a determination and volatility that would have delighted a hedge fund manager. The third place in the championship went to Richard Rooley (34 points), John Ferrie came second with 36 and the thoroughly worthy Champion was David Scahill with 40 points.



*Club Champion David Scahill*

## **The Swordsman**

The Master was able to duly present himself with the prizes for Longest Drive and Nearest the Pin.



*The Master, John Robinson, receiving the prize for the longest drive and nearest to the pin from his wife, the Mistress Doreen. She said he could only have one prize so it was combined!*

This was a cracking weekend and exemplified the Company's values: well organised, sociable, tolerant and hugely welcoming to guests and partners alike. Anyone who has ever picked up a golf club would be warmly recommended to try it!

*Rob Walmsley*

## **HIDCOTE MANOR GARDEN** **26th July 2010**

While the intrepid golfers were leaving the hotel to participate in the annual golf competition a party of 5 non-golfing partners with their leader Gillian Nussey boarded a luxury people-carrier for their visit to National Trust garden at Hidcote Manor near Chipping Camden.



*Poppies at Hidcote*

This is one of England's great gardens and was designed and created by the horticulturist Major Lawrence Johnston (an American) in the 'Arts & Crafts' style. Johnston spent 41 years creating what would become England's most influential 20<sup>th</sup> century garden. He began work in 1907 developing a garden out of the fields surrounding the house

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planting a series of outdoor rooms offering surprises and discoveries at each turn. Each room had its own distinct atmosphere and character with hedges of holly, beech, hornbeam and yew dividing up the rooms. He donated Hidcote Manor Garden to the National Trust and it became their first property acquired specifically for its garden.

On our journey round we were fortunate to have our own botanical expert from Kew Gardens, Ruth Cousins. She was able to answer all our questions about flowers, trees and bushes; in fact, we had a group of other visitors to the garden trailing us around listening to her commentary. We were entranced to learn that you can smell the scent of flowers far more strongly a short distance from the bloom rather than putting your nose closer into the flower because the purpose of scent is to attract the bees while they are flying around – a blinding glimpse of the obvious when it is explained so well!



*Davidia Involucrata or Handkerchief Tree brought from China to France and hence to Hidcote by the French Missionary and Botanist Abbé Jean Pierre David, the first Westerner to see the Giant Panda in the wild*

After a delightful lunch, it was off to the excellent Garden Shop. One Past Master's wife managed to buy a few essential floral additions to her garden and we were then taken on a tour of the Cotswolds returning in time to see the final group of golfers on the 18<sup>th</sup> hole.



*Trophies from Hidcote Garden Shop*

We should like to thank Gillian, who while not participating in the golf weekend, kindly organised the wonderful day for the non-golfers and used her extensive local knowledge to show the area to us at its best.

*Margaret Skinner*



## VISIT TO EAST YORKSHIRE 24th to 26<sup>th</sup> September 2010

your fellow Liverymen better and being very enjoyable and informative.

*Raymond Cousins*

On Friday morning some 80 Liverymen and guests began gathering at the Willerby Manor Hotel for coffee and a greeting by the Master John Robinson and his wife Doreen and were presented with a welcome pack for an exciting weekend. This comfortable hotel, owned by a Past Master Woolman, wine merchant and former MP who was on hand to add his personal welcome, is in a largely residential area close to Hull and a good centre for the weekend's activities.

During the weekend it became obvious how much the Master was respected in the area and how hard he and Doreen had worked to ensure that everything went smoothly. Everywhere we went our hosts were keen to repay the work that John had put into the various organisations that we visited. The portrait of John below is hung in the dining room of the Staff House where we had lunch on the first day.



*Portrait of the Master John Robinson as Pro-Chancellor of Hull University from 1998 to 2006 by John Bashall in 2006*

This Out of Town visit was slightly shorter than other recent visits starting with lunch on the Friday rather than with dinner on Thursday evening. The idea was to try to encourage those Liverymen still hard at work to come by reducing the amount of time they might have to have off work. In the event the difference in attendance was small and John and Doreen kept us fully occupied until after Sunday Lunch with many interesting tours and entertainment. The reports on the various parts of the weekend follow and I warmly recommend the Out of Town visits as a thoroughly worthwhile means of getting to know

## Technical Tour of Hull University

### Bone Shaking & Tongue Wagging!

The first visit of the 2010 annual "Out of Town" meeting was to the University of Hull of which our Master, John Robinson was Pro-Chancellor and Chairman of the Governing Council. The University claims to be a progressive university, constantly investing in its facilities and resources, and committed to helping students to fulfil their potential at a top-class university.



*Hull University Staff House*

After an excellent lunch in the University's Staff House, the



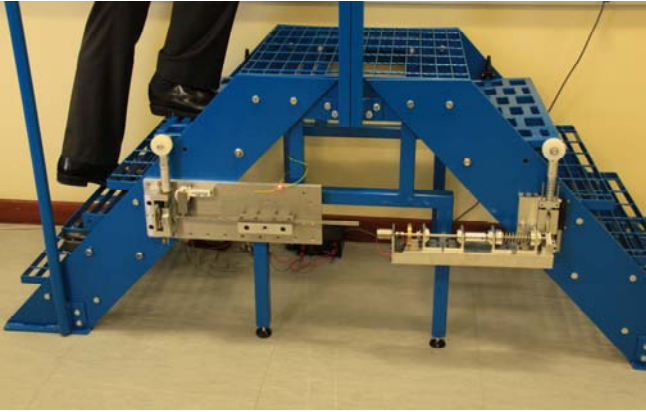
Master introduced the University's Vice-Chancellor Professor Calie Pistorius (*picture left*) who took up the position in 2009 having previously been the Vice-Chancellor and Principal of the University of Pretoria, South Africa. The Vice-Chancellor said that the University of Hull is a 'friendly university' putting students at the heart of everything it does. He emphasised that they were proud of

their academic reputation reflected in the high quality of the education provided. This claim was supported by the fact that 2009 was the fifth successive year that the University had retained its position in the top 10 of the UK's mainstream universities for Student Satisfaction in the National Student Survey which is the basis of the UK's independent quality assurance framework. The Survey is designed to inform prospective students about what and where to study. Professor Pistorius went on to mention that

## *The Swordsman*

the University came 9th out of the English mainstream universities with an overall student satisfaction of 87%.

The Vice-Chancellor then introduced the Head of the Department of Engineering – Dr Philip Rubini who explained that the main engineering research themes are energy, environment and healthcare, with collaboration with Microsoft, Smith and Nephew, Sony, Volvo, Daimler and Airbus. Following the introductory speeches, we were split into groups for visits to a few departments to see some of the work being carried out on the campus.



*Two Types of Step Generators*

Dr James Gilbert of the University's Engineering Department described some of the work being done on energy harvesting – including a stairway with individual steps that deflect downwards under a person's weight. The treads are linked to electricity generators that are actuated by the vertical movements both downwards and upwards. Underground railway stations and subways are potential sites for such systems.

James Ward, a research lecturer in the Simulation and Visualization Group of the Department of Computer Science gave a demonstration of their Venus Project – Venus being the contraction for Virtual Exploration of Underwater Sites. The aims of the project are to provide scientific methodologies and technological tools for the virtual exploration of deep underwater archaeology sites such as shipwrecks. The software, techniques and computer graphics were developed at the University. After his presentation, James invited each of us to drive a remotely operated unmanned vehicle in a virtual underwater environment.

Professor of Medical and Biological Engineering Michael Fagan gave a fascinating insight into his department's research on bio-mechanics which includes work at the cellular level through to the whole bone level. We learned that bone adapts to mechanical usage and both its external geometry and internal architecture are influenced by muscle and body loads, as well as genetic factors. In other words, bone adapts to the loading it experiences, although the mechanical stimuli that drive that adaptation are still not fully understood. Professor Fagan said that the aim of the work is to separate out the two mechanisms (mechanical usage and genetic stimuli), by studying the human femur as it develops from its pre-natal form to the mature adult shape.

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In particular, the development and change of the internal architecture is being examined to understand the effect of different and varying loads on bone experienced during normal activities. For example, it is known that bone responds not only to load magnitude but also loading frequency and recent studies have shown significant changes in bone density by standing on a vibrating platform for just 10 minutes a day, and yet bone does not respond to high static loads. Researchers at the University hope that the results of their research will not only add our general understanding of how bone works, but also reveal the causes and effects of congenital musculoskeletal diseases and those diseases experienced in later life, such as osteoporosis, and ultimately lead to new methods of management and treatment.



*Old and New Hip Replacement Joints. The former is cemented in, the latter grows bone rapidly over the noduled surface (Osseointegration)*

The VERT (Virtual Environment for Radiotherapy Training) is a virtual reality teaching tool for training students and medical staff to use modern radiotherapy equipment for cancer treatment. Its origin was an MSc project in the University of Hull. Professor Roger Phillips gave a first-rate 3D demonstration of the machine's capabilities with a simulation of treatment for prostate cancer.



*The Visual Imaging Scanner  
Photo courtesy of Virtual Ltd*

## Partners Tour of Hull University Art Collection

Dr Steeve Lamvohee, a research fellow in medical engineering, said that restoration of vocal function after laryngectomy is one of the challenges patients face after throat cancer surgery. The most common approach is to use a prosthetic valve which diverts air from the trachea into the oesophagus. Although the initial performance of the valves is excellent, they deteriorate due to bacteria (biofilm) build-up and fail to operate within a very short time, frequently in less than three months, sometimes in only two weeks. When bacteria build up on the surface of the silicone material of the valve, it changes the mechanical properties of the silicone, causing the valve to leak or require increased



pressure for the patient to speak. It estimated that there are 16,500 valve changes every year in the UK alone – at a cost to the NHS of nearly £10 million. To improve the outcome for these patients researchers at the University are developing a novel speech valve manufactured from an advanced engineering ceramic that is resistant to biofilm growth. Laboratory tests indicate that the new design of valve will have a significantly longer life – perhaps 18 months or more and clinical trials are to be started soon.

An alternative to the speech valve is being developed at the University. It is a speech recognition system, principally for people who could speak normally before laryngectomy, or for people working in noisy environments. Use of the device was ably demonstrated by Dr Sergey Rybchenko a researcher in the University who explained that by implanting several permanent magnets on the tongue and inside the lips (the articulators that generate speech sounds in the voice) and wearing a spectacle frame fitted with sensors the varying three dimensional magnetic fields during mimed speech could be transmitted to a computer. By monitoring the magnetic fields, the system identifies patterns corresponding to elements of normal speech and recognizes the intended speech in the absence of any audio information. For his demonstration, Dr Rybchenko had only one magnet temporarily attached to his tongue using an adhesive. He then mimed numbers one to nine and zero. Even with the reduced number of magnets for the demonstration, the success rate for recognition was as high as 80%.

The visit to the University was extremely interesting and furthermore we were privileged to be given presentations by some of the researchers themselves. Professor Fagan said afterwards, “I must say I really enjoyed your group's visit (and Castle Howard!) – it was intense, but very stimulating. We all also appreciate your enthusiasm and interest in our work”.

*Philip Ramsell*

After a superb lunch, the Partners’ afternoon consisted of a whistle-stop tour of the hidden treasures of the University. We split into two groups and our first port of call was to the South-East Asia Museum, which housed artefacts from across the region. We were given a short introductory talk before being given a few minutes to look around. Amongst the artefacts were some stunning shadow puppets and Wayang Golek 3D puppets. All too quickly we were being



moved on out into the rain to walk to the Art Collection housed in the bowels of another building.

The Collection, entitled Art in Britain 1890 to 1940, specialises in paintings, sculpture, prints and drawings by artists of the ‘Camden Town Group’ together with Gore and Bloomsbury artists, with pride of place being given to Frank Dobson’s ‘Cornucopia’. After a short talk, we were able to marvel at the Henry Moore bronze, portrait heads by Epstein and much more before being whisked off to the Business School.



*The Global Pop Toad with some University Buildings*

Our guide showed us all around the high-tech facilities of the Logistics Institute and Business School but I suspect that we would all rather have liked to stay and have a ‘play’ on the dock crane or excavator simulators which we saw at the beginning!

## **Dinner at the Willerby Manor Hotel**



*View of the University from the 7th Floor*

After enjoying the outside sculptures ‘Moving Heads’ and ‘Global Pop Toad’ (the favourite), we walked back to the library which houses a million books and periodicals, including rare books and first editions. We were taken up to the seventh floor to see the fantastic panoramic view of the surrounding area and wondered whether the students were ever able to concentrate on their studies, with so much to see outside.

Finally we made our way back for a well earned cup of tea!

*Gillian Gasper*

*An additional contribution was received from Liveryman Peter Gray who preferred the pleasures of the Partners’ programme to the technicalities.*

Attracted by the Hull University Art Collection, I played truant at the University and joined the Partners Tour.

The art was fascinating, as was the South East Asia Museum, particularly for a one-time Hong Kong resident.

The unexpected icing on the cake was the Logistics Centre, sampled as I again played truant from the University library visit!

With two tutors I was given the use of an excavator simulator and a tower crane simulator. What did I learn? On the first, how difficult it is to judge distance from the machine when releasing a load, and on the second, how not to counter sway - quite a challenge with a high jib and a heavy swinging load. One expert revealed that many drivers handle this by simply grounding the load and letting the oscillations self subside.

Please could we have another simulator session, as it would improve the nation’s skills with challenging machines, postpone Alzheimer’s and be as much fun as it was in the aircraft and helicopter simulators.

*Peter Gray*

Having enjoyed the full lunch time and afternoon programme, we eagerly awaited the welcome dinner in the Lafite Room (the owner was a wine merchant after all) of the Willerby Manor Hotel. The reception was informal and gave us all an opportunity to relax and meet friends old and new. The seating was informal with each table named to reflect local heroes, and heroines, some well know and other more obscure.



The Master gave us all a warm welcome to the East Riding of Yorkshire, described the visit venues, and made it official that we had a busy programme. He outlined the key issues to be observed at each venue and of particular note was; don’t get wedged in the hooped ladder when visiting the Humber Bridge! We thank you

Master for this advice, which was duly noted.

A silent auction was conducted throughout the dinner, for the use of the John Laing Box at the Royal Albert Hall to see Carmina Burana on Saturday the 20th October, with the proceeds going to the Charitable Fund. The bidding was brisk, but the pace quickened toward the announcement of the winner and, following a discreet conversation with Margaret Skinner, was won by John Baxter. Thank you John for your most generous bid of £750.

Following an excellent meal and convivial conversation the Table Challenge this year was to speak about local heroes and heroines. Each table’s presenter shared some often dubious facts, fictional exploits and tenuous relationships of their local hero or heroine. The record was put straight by the Master who gave a synopsis of true information, which in many cases bore little relationship to the story told. The winners were on the Fred Elwell Table, with the award being given for the most diverse number of careers described, the descriptions being a long way from reality, but presented with real conviction and style. Our thanks go to all the presenters for making this such an enjoyable feature of the evening. By the way Fred Elwell is a local painter and many of his paintings are exhibited in the streets of Beverley.



A Fred Elwell Painting hung on the Railings in Beverley

This most enjoyable first day of the out-of-town weekend concluded with an adjournment to the bar by some and bed by others.

Barry Gasper

### Visit to the Humber Bridge 25th September

On Saturday, the party split into two halves so that, in the morning, forty or so could visit Hull City's 'Deep', the world's only submariun, while the other half could visit the Humber Bridge. We met for the customary excellent lunch at the 'Deep' before swapping visits for the afternoon.



Walking out to the Abutment whilst others rode on Golf Buggies to the centre of the Bridge

At the Humber Bridge, we were warmly welcomed by Peter Hill, the experienced Bridge Master in the very comfortable office suite on the North, Hessle, side of the bridge. After a very thorough, not to say slightly alarming safety briefing from Sally Pritlove, we kitted up in hair nets (yes all of us), safety helmets, high visibility vests and gloves and set off. The party was divided into two halves to simplify supervision. One party set off in six golf buggies, borrowed from local golf clubs, to the mid span of the bridge. As we travelled out we noticed all the traditional access hatches, no

more than 450mm square and were relieved to stop at the new enlarged midspan access hatchway, at least 700 x 600. In we all went to view the inside. The bridge is a very simple design concept.



Inside a Diaphragm

Transverse diaphragms, at five metre centres, span between the two planes of cables and in turn support the stiffened top flange and restrain the stiffened side webs and bottom flange. Elegant detailing minimises fatigue damage. The inside looked in pristine condition.

On the way out we had noticed several small pipes running up the hangars to the main cables and could not understand what they could be for – the best guess was that they were part of the bridge lighting system.



Entry to the Anchorage

We then returned by golf buggy to the main anchorage block on the north side, to change places with the other party. Another daunting entry down a vertical 25 step ladder, fortunately caged, took us into the main chamber at the heart of the foundation, where the cables are anchored. In a well lit, though slightly chilly, interior an excellent presentation summarised the simple but effective way the cables had originally been 'spun', two 7mm wires at a time, across the bridge. Bundles of wires were carefully formed into strands and bundles of strands were then formed onto the main cables. These were then wrapped to protect them from corrosion.

## Visit to the Deep, The World's only Submarium



*The Master and Barbara Dickinson kitted up ready to Descend to the Abutment*

A second presentation described how the life of the cables is being extended. Following concerns at the observed deterioration of the cables on the Severn Bridge, sample lengths of these cables had been painstakingly unwrapped, individual wires carefully wedged apart and inspected. The general condition was less alarming than Severn but some action was clearly necessary if the bridge were to reach its design life of 120 years. Now we understood the reason for all those pipes! The entire cables now have an active dehumidification system. Without any moisture, the corrosion has stopped and the cables should last at least the remaining 90 years of the original design life.

Overall, the bridge looked in remarkably good condition, testament to both the care with which 'the Bridge to nowhere' had originally been constructed and subsequently maintained. The originally epithet was coined when the commitment to construct the bridge was first made, by Barbara Castle as Transport Minister, in order to encourage a Labour victory in a critical by-election! It is now clearly a very important part of the local infrastructure, earning £22 million per year and set to clear all its debts in 40 years.

Overall this had been an excellent visit to an outstanding piece of British engineering - for many years the longest bridge in the world. We offer our heartfelt thanks to Peter Hill and his team for making us feel so welcome.

*Graham Owens*

The Hull City Council decided in the early 1990's that it required an iconic attraction to bring tourists to this historic City in order to stimulate the economy. Colin Brown, who at that time was the Chief Officer responsible for Tourism and Leisure, and is now the Director of The Deep, told us how he engaged the Natural History Museum as consultants. Hull has had a relationship with the sea for many years though its history as a whaling and fishing port and so it was decided that a Museum of the Sea would be built rather than simply an aquarium full of fish. The Centre also has a Business Centre for use by start up companies and accommodates a Hydraulic Research Centre or Flume for the University of Hull. The Deep is a Charitable Trust with its focus on Marine Research and Education. It has worked closely with the Jacques Cousteau foundation since its inception and has earned a worldwide reputation.



Colin Brown (picture left) told us that construction started in the late 1990's and it was opened on December 31<sup>st</sup> 1999 (for the purpose of ensuring that funds were released!) although was not fully completed until a little later. The total cost of the initial phase was £45.5m funded by the Millennium fund and the European Commission together with Hull City Council and private donations.

The Deep operated with a £700,000 surplus in 2009 and presently has £1.6m cash available for future development. The next project is to build an Amazon River display in the old dry dock. The Deep has received 4m visitors in the 8½ years since it was opened including 30,000 children per year on education visits. Its success compares favourably with that of the Eden project in Cornwall.

In addition to visiting the public area we went behind the scenes of the Submarium and visited the Hydraulic Research laboratory.

### The Public Exhibition

In the foyer of the Deep was a sculpture of a frog! We had learned at dinner the previous evening that Philip Larkin, the poet, lived in Hull and had an affection for Toads. This Toad was one of forty being exhibited in Hull and the surrounding neighbourhood over a ten week period to mark the 25<sup>th</sup> Anniversary of his death.

Behind the Scenes in the Deep



The Toad in the Foyer

The entry to the aquarium provides a history of the sea from the beginning of time showing the evolution of living creatures through a series of interactive exhibits starting with the origin of water. It is perhaps surprising that we know more about Space than about the Sea.



Living Corals in the Deep



Rays

The next exhibit was the lagoon tank followed by a number of windows opening onto the main tank where a wide range of sea animals were on display in their replicated natural habitat. The aquarium contains over 3500 fish and sea animals

Paul Hutchings explained to us the operation of the Aquarium and its systems for controlling water quality. We first entered the Quarantine department where a wide range of fish were swimming in a large tropical tank which was 10 metres deep and contained 2.6bn litres of water and operated at 26degrees centigrade. 10% of the water is changed each week and is fully re-circulated every 90minutes. We were also shown a much smaller North Sea tank which operated at 10degrees centigrade.

Water is collected from the estuary and all the nutrients and minerals are removed by osmosis including the salt. The required level of salt is then added back together with some 70 nutrients and minerals.

The tank contained a wide variety of fish including Sharks, Swordfish and Rays. New stock remains in the tank for between 4-6 weeks before being moved to the main aquarium and sick animals remain in the tank until they have recovered. Regular tests (e.g. blood tests) are performed on the animals often requiring them to be anaesthetised. The Deep employs a full time Vet who operates out of London and is on 24hour call. In this area Jelly fish and other animals are bred for use by other aquariums.



Fish at the Open Top of the Deep Aquarium

The water passing through the tanks is continually filtered to remove sand and is sterilised using Ultra Violet sterilisers. Proteins are removed using a skimmer which also acts as the sand filter for the large tank. The whole system is monitored using a SCADA (Health monitoring) system which measures pH levels, temperature, water levels and a number of other parameters. The visit served to illustrate the complexity of the engineering in a facility of this size and nature.

The Hydraulic Research facility or Flume

Lynne Frostick, a world renowned Professor of Geology at the University of Hull told us that the purpose of the research facility was to study the flow of water in rivers and estuaries in the real environment where both the geological structure is properly represented and where natural

## *The Swordsman*

vegetation and animals can be introduced, features which are often omitted in University laboratories.

Stewart McLelland described the operation of the facility which is 16metres long with an 11metre working section, is 6 metres wide and 1.8m deep. The building in which it is housed contains flood barriers in case of an accident. The water is continually re-circulated by two pumps which have a combined maximum capacity of 1000 cubic centimetres per second and can accommodate sediment. It features a wave generator comprising eight paddles which can generate a range of different wave forms by individually synchronising the paddles. The wave velocity is measured by a series of acoustic sensors. There are a range of sprinklers above the working section to simulate rainfall at the correct energy level although their height is such that the droplets are not fully representative. Strong lighting assists in growing vegetation. The base of the flume is arranged so that boxes containing different types of sediment can be introduced into the measuring section.



*The Modelling Tank*

Measurements are taken by using a submersible and traversable Particle Image Velocity system (PIV) which uses two laser beams to track particle flows. When very accurate measurements are required, a Laser Doppler Anemometer is used but this is less versatile.

The facility has been used for a number of research topics including

- The determination of the roughness of river beds as a function of the orientation of gravel in support of modelling techniques.
- The interaction of vegetation and flood events on the deposit of sediment including the growth of grass, germination of seeds and roots structures.
- Simulation of Budle Bay in Northumberland where algae were grown for three to four weeks. It was established that the algae controlled the amount of sediment that was deposited. A case was cited where the level of sediment in the estuary rose by over one metre due to the presence of algae in the summer months.

In addition to research topics, the flume has been used to establish the performance of a hydroelectric power device

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which used hydrofoils to generate power from either the fluid flow at a sewage outlet or from tidal flow. It was demonstrated to be quite efficient but the infrastructure costs made it uneconomic.

*Phil Ruffles*

## **Dinner at Castle Howard 25th September**

The highpoint of the recent Out-of Town was a magnificent dinner in the wonderful setting of Castle Howard.

After a brief detour while the bus driver attempted to find a gateway into the estate which exceeded the width of the bus by an acceptable margin, we all assembled in the magnificent chapel. This was originally to be the dining room until someone pointed out that it was several hundred yards from the kitchens; this beautiful building had to have its floor lowered 1m (no mean feat) as the owner did not believe that a place of worship should be on the same level as the rest of the rooms. The Chapel is lavishly decorated, having been based on Holbein's designs for the Royal Chapel at St. James Palace



*The Chapel*

We were given a detailed overview of the Castle, its history and that of the Howard family. The house was built over 300 years ago and has been the home of the Howard family from that time. Lord William Howard (1563-1640) laid claim to Henderkelfe in Yorkshire, the land on which the castle sits today. The house was built by Vanbrugh for Charles Howard, the third Earl of Carlisle, after he had fallen out with the original architect, William Talman.

The current residents of this magnificent pile, the Hon. Simon Howard and his wife Rebecca, joined us for pre-dinner drinks in the appropriately named Great Hall. Simon soon got on to a topical theme with engineering overtones: sustainability, heating costs and underground heat pumps. He talked of installing boilers which were fuelled by wood shavings from the estate timber yards, and the major project to install an underground heat-pump to supplement the heating of this large and drafty edifice. "Underground", it turned out, was a misnomer and should have been "underwater" as the heat-pump coils are actually laid on the



## The Swordsman

bed of the estates major lake, some distance from the house. Significant savings had been realised and Simon was clearly proud of his foray into the world of engineering.



*Installation of the Heat Recovery System  
Photo Courtesy of Ecovision Systems Ltd*

After our discourse on heat pumps, we paraded through many of the rooms of the house, each attended by a very knowledgeable custodian who shared many of the secrets and intricacies of the internal fixtures and fittings. To see a house which at one and the same time was a great museum collection and a living home was truly a privilege.



*Castle Howard small dining Room*



*The Long Gallery*

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We arrived, at last, at the dining room, or rather dining rooms, since we were to occupy the Long Gallery South, the Octagon and the Long Gallery North, populated with many tables for 10 guests each. The large archways joining the three provided a view of the whole proceedings from wherever one sat.

Dinner consisted of fresh salmon mousse, with oak-smoked salmon, herb-infused Gloucester old spot pork loin in calvados and apricot glaze; finished off with Lemon posset and Castle Howard cookies. All washed down with good red and white wines, coffee and port.

Our Master, proposed a toast to our guests. His good friend, Dr. Allen Suggett, gave the response and in a eloquent, but well-timed, speech revealed much of the engineering, entrepreneurial and industrial strengths of the region of Yorkshire in which we were being so richly entertained.

And so a merry bunch of the Master Wardens, Liverymen, Freeman, spouses, partners and guests wandered back through the passages which have witnessed over 300 years of history to the waiting coaches and hence to bed. A good night was had by all.

*Ric Parker*

## Tour and Service at Beverley Minster 26th September

Beverley Minster has been described as, after Westminster Abbey, the finest non-cathedral building in Britain! A description that we found to be very true. The first party of the Company arrived at the Minster in time for a talk on the history of the building and a tour before the morning service.



The majority of the Gothic style building which, is of limestone, was built between the early thirteenth and the mid fourteenth centuries. The great East window which contains the only remaining medieval glass dates from a little later. At the Reformation, the building was saved from being used as a quarry by its purchase by the Town Corporation for 100 pounds for use as the Parish Church. At

the end of the seventeenth century the North wall of the major transept was in danger of falling out and of taking a major part of the building with it. Hawksmoor, who was the architect at the time, lifted and underpinned the wall, and pushed it back upright although one of the adjoining pillars still has a discernable tilt!



After the talk, the major part of the party ascended the 113 steps of spiral staircase to the roof space above the vaulting. The 15 ft. diameter oak treadwheel is still employed to lift some of repair materials up to the workspace located above the vaulting of the central tower.

The party were able to see medieval roof timbers, traces of the collapsed minor transept

tower and the 600 year old bricks which, rather unusually, form the vaults between the stone ribs of the Nave. These are still in perfect condition.

At the morning service, the Company were welcomed by the Minister who had been a guest at the Livery Dinner and had said Grace, the previous evening. The Master read the first lesson during the Service and the Minister preached on the theme of Reconciliation. Following the Service, the second party had their talk and guided tour.



*The Fletchers' Wall*

The whole party then walked through the town to the Beverley Arms Hotel for lunch. This walk was made memorable by the fact that the Master had distributed a map indicating where we could find various indicators of the medieval town guilds which we were challenged to locate.

*Cecil French*

## **VISIT TO THE OLYMPIC PARK 28th September 2010**

Some 18 members and guests made a visit to the Olympic Park on Tuesday 28<sup>th</sup> September. This was the third such visit for the Company, kindly arranged by Court Assistant Peter Blair-Fish, who is himself a Senior Project Manager

with CB&I Lummus. Many of us had not visited before but for those who had it provided an update on the substantial progress since the last visit.

The ODA's delivery partner CLM (CH2M Hill, Laing O'Rourke and Mace) gave us an overview of progress to date and of the delivery strategy, followed by a site bus tour visiting the main venues in the Park and then detailed presentations on engineering aspects of the Aquatics Centre, the Olympic Stadium and the Velodrome.

The Olympic Delivery Authority is now into the final year of the development of the Olympic Park and other venues. In June 2011, the project will be completed and handed over to the London 2012 Organising Committee of the Olympic Games and Paralympic Games (LOCOG), and a succession of trial events will be held at the various venues in preparation for 2012. Trials are already being held at the Lee Valley White Water Centre.

Progress at the Olympic Park is on time, within budget and very impressive. The total budget is £9.3bn, the maximum monthly spend has been £190m and at times there have been some 10000 people working on the site. When work commenced in June 2006 the 360 hectare site was in places heavily contaminated and criss-crossed with overhead power lines, waterways, sewers, roads and railways. Power lines had to be relocated into underground tunnels, roads and railways moved, and huge amounts of soil and waste decontaminated, 90% of which has been recycled.

The situation now is that all the main buildings are nearing completion and are moving into final finishing and fitting-out. The permanent road network is being constructed, 8km of waterways are in the process of relining and renovation, and over 300km of piping and ducts have been laid for power, chp, data and telecommunications. The Olympic Village – which will house up to 17000 athletes – is rising fast.

The Development Authority and the contractors have together established a very strong commitment to Health and Safety throughout the project, and with a total of over 2 million man hours on site the accident rate has been less than 0.18 – a commendable record.



*The Aquatics Centre*

Great attention is also being paid to landscaping and environmental issues and the support of wildlife habitats. Wildflower meadows equivalent to the area of 10 football pitches are incorporated into the site, and research is underway, with some success, to determine whether wildflowers that usually bloom in the spring could be persuaded to bloom in the summer instead! River habitats and wetland planting are being developed to encourage bird and animal life (and to discourage Canadian Geese!), and a British Garden is being developed adjacent to the main Stadium.

Each of the venues and buildings in the Park has been designed not only for the Olympics and Paralympics but also with a view to the subsequent legacy, where the number of seats may need to be reduced to make the venue suitable and economic for future use. For example the Aquatic Centre will accommodate 17000 spectators for the Olympics reducing to 2500 for legacy use. This is achieved by providing high additional stands which are cantilevered out over the river but can be removed after 2012.

The Centre has a beautiful but extraordinarily intricate steel roof structure weighing 3500 t which required complex design and construction. We watched a time-span video showing it being assembled on temporary supports before eventually being jacked up to allow these to be removed, and then dropped into position where it settled within a few mm of the plan. 12,300m of roofing board strips were then installed, one at a time.

The Velodrome track has very recently been completed. It was designed and laid under the control of a world expert who is renowned for producing fast tracks, and consists of 6m lengths of Scandinavian pine each about 40mm square, all nailed into position by hand to make a 250m oval steeply banked track. The roof structure is based on a cable net or grid (16km of cable) with nodes joining the cables at each intersection, which was raised into position by a jacking system. It follows the contours of the track – which helps competitors by giving an even sound effect all the way round. After the roof was raised, prefabricated roof panels were dropped into position within each cell, effectively held there by hooks over the cables, and then covered by aluminium roofing strips. It was said that although the roof is effectively suspended there is virtually no vertical movement – and the weight is 100t by comparison with a steel roof which would be 800t. The Velodrome is to remain as at present in legacy mode, ie with 6000 seats – as there is an ongoing demand for a national venue in a sport which has become very strong in the UK in recent years.



*The Olympic Stadium*

The Olympic Stadium design is based on 80000 seats for the Olympics, reducing to 25000 in legacy mode, but the exact configuration will depend on the bid accepted for legacy use. The principle is that the upper tiers of 56000 seats are based on a bolted structure and can be removed.

In Olympic mode, the stadium is still very compact and we were told that it would actually fit inside the Wembley stadium! The roof design was based on extensive modelling and wind tunnel tests to ensure minimum turbulence on the track – tail winds must be less than 2m/s if a world record is to be ratified, and of course head winds are not conducive to fast performance. Open bowl stadiums generate considerable turbulence, so a partial PVC roof has been provided covering the upper bowl. (We understand that the material used for the Beijing Birds Nest stadium proved to be insufficiently fire resistant and was peppered with holes from fireworks used at the Opening Ceremony!) The roof design is based on two concentric steel rings with radial cables, and again we were able to watch a time-span video of the roof and floodlight tower erection process.



*The Basketball Stadium*

The basketball stadium is a temporary structure and will be dismantled after 2012 because there is not thought to be an ongoing demand for the facility. It is surprisingly tall due to the stands, and is walled in pvc. The handball stadium however will be retained in legacy mode to provide a general purpose indoor sport facility.



*The Olympic Stadium*

There is a massive Broadcast and Media Centre building to provide facilities for worldwide coverage of the Olympics and Paralympics – care of the media is seen to be a very important part of the world profile of the UK at these events.

The importance of the legacy mode extends also to the infrastructure of the Park. For example there are a number of road and pedestrian routes and bridges which will essentially consist of two parts – a permanent bridge for legacy use and a second temporary bridge alongside which will subsequently be removed.

Security across the whole site is understandably very stringent – with all the features you might expect and the use of high technology security measures guarding access to the site and the delivery of materials and prefabricated components.

The logistics of site and contractor management are very well organised and controlled to avoid congestion, to provide a safe working environment and to manage the attendance of thousands of on-site personnel every day, all arriving by public transport. Lorry deliveries are managed through two holding facilities several miles from the site, through which all deliveries must be scheduled.

In terms of management, great importance is attached to the role of over 100 stakeholders – many of whom may of course have different agendas which have to be reconciled! All the relevant stakeholders sign off each design at stage D, which sometimes requires 30 or more signatures. Having set a clear vision, the challenges are broken down into achievable outcomes, then strategies, key performance indicators and progress indicators. Data collection tools are in place to monitor progress and all reports are continuously audited. It was clear that very good relationships had been established with multiple contractors through effective and ongoing communications and that good practice is shared across the site.

One of the speakers referred to the Olympic development as “UK plc on the world stage”. It is certainly that, and the abiding memories of the visit for many of us will be the very clear high quality management of the whole operation, the way in which health and safety was so fundamental to everyone we met, the enthusiasm and commitment of the whole team, and the way in which such a huge and complex project has remained on time and within budget. We send them our thanks for a very informative and enjoyable visit and our congratulations on their achievements – and particular thanks to Peter Blair-Fish, the ODA and CLM for organising this third visit.

*Peter Lines*

*Aerial view photographs courtesy London 2012*

## **LADIES LUNCHEON**

### **House of Lords**

### **6th October 2010**

This occasion was held in the very prestigious setting of the Cholmondeley Room at the House of Lords in the Palace of Westminster. This has been a royal palace for around a 1000 years and home to the UK Parliament for nearly 500 years.

In addition we had the option of a visit to Parliament before the luncheon and about 40 of us gathered at 10.00am, after going through rigorous security into Westminster Hall. This alone is an amazing building which, together with the Jewel Tower, survived the fire of 1834 intact – everything else had to be rebuilt a task that took 20 years. This Hall has been used for many auspicious events such as coronation banquets and law courts, one of the most famous trials being that of Guy Fawkes. Today it is used for ceremonial events and it is still customary for monarchs to lie in state here after their deaths. The most recent visitor was the Pope, just a few weeks ago, and he gave an address from the steps of the Hall.

We split into two groups, each with a guide. The full tour took about 90 minutes and we saw the opulent House of Lords with beautiful gold carvings and the guide explained to us where everyone sat including on the Crossbenches and how, because of her flowing robes, the Queen comes in one side and out the other to facilitate the management of her gowns. Then we went through to the House of Commons where again the guide explained the procedures for each day. We visited St Stephens Hall, the Central Lobby and the Queen's Robing Room the guide even explained to us about Prince Philip's Room which has the first flushing toilet in the UK designed by Crapper!



*Enjoying Pre-luncheon Drinks on the Terrace.*

We then met up with the rest of the Ladies who had not been on the tour making 57 ladies lunching at the House of Lords in the Cholmondeley Dining Room. By now the day that had started out with heavy rain turned into a glorious warm sunny day and we were able to have our pre-luncheon drinks

out on the terrace overlooking the Thames where, of course, the specially labelled House of Lords Sauvignon Blanc and Pinot Noir wines were provided.

This was indeed a most special luncheon which our speaker, the Rt. Hon Baroness Brenda Dean of Thornton-le-Fylde, volunteered to sponsor for us as she is a Working Peer in the House of Lords so we were very privileged.

The menu was magnificent and prepared by the French Chef even down to the little touch for ladies of heart shaped croutons and the beautiful little box of House of Lords Truffles to accompany our coffee – though I think like me many would have taken this home as a little souvenir.

The Master's Lady Mrs Doreen Robinson said Grace then we proceeded to the meal which as one would expect of a ladies luncheon was accompanied by a lot of very happy chatter.



*The Master's Lady Doreen Robinson and Principal Guest the Rt. Hon Baroness Brenda Dean.*

Mrs Doreen Robinson then introduced our very prestigious speaker for the day. The Rt. Hon Baroness Dean of Thornton-Le-Fylde was such an elegant and enthusiastic speaker telling us all about the internal workings of the House of Lords and how proceedings are conducted. She has done such good work and was recently chairman of the Armed Forces Pay Review Body as well as being director of a number of companies. She mentioned that there are many more ladies now in the House of Lords and when there are debates they often outnumber the men!

The luncheon concluded with a vote of thanks from Mrs Judith Banyard, the Senior Warden's Lady who also proposed the Toast to the Company.

Well, such a special day came to an end, and we all went merrily out into the lovely sunny day, some stayed to visit the Jewel Tower which had been arranged for us, whilst others went to other London delights or straight home.

As for myself I felt the journey down from Stonehaven in Scotland had been more than worthwhile. The Worshipful

Company of Engineers do seem to come up trumps with the venues and speakers!

*Kathryn Pope*

## **VISIT TO HMS SULTAN BY AFFILIATED LIVERY COMPANIES 27th October 2010**

The Company was represented by Assistant Commodore Barry Brooks and his wife Linda and the Clerk, Wing Commander Tony Willenbruch, at what is turning into an annual briefing day for affiliated Livery Companies. Some 38 Liverymen and their guests, from the Turners, Founders, Blacksmiths, Fuellers, Plumbers, Shipwrights and Engineers, were extremely well hosted by Commodore Mark Slawson (Commandant of the Defence College of Electro-Mechanical Engineering, and Commanding Officer of the whole of the HMS SULTAN establishment), his wife and over 20 of his officers and staff. At a time of great uncertainty within the MOD's training staffs as a consequence of the recent Strategic Defence and Security Review's announcement that the Defence Training Rationalisation programme has been stopped, the team, including Captain Graham Watts (Captain, Royal Navy School of Marine Engineering, who attended our recent Award dinner) were all very positive about the work that they do in generating "just enough, just in time" training for Royal Navy and other embryonic technicians and engineers. Achievements from their training model include a radical reduction in wastage (from ~16% early exits of trainees to around 5.5%) by inspiring a strong sense of purpose, team spirit and hands-on learning that produces more self-confident ratings, and officers, as they join their ships. In turn, HMS SULTAN has been applauded by their "customer", the Fleet, for the high quality of those personnel and the relative ease with which they become integral to the ships' companies.

Presentations highlighted the history of the site (from its very early days as a Royal Flying Corps air station) and the scale of trainee throughput from the various schools on site (including those for nuclear engineering, air engineering, and courses run by the Training Partner VT Flagship, now part of Babcock International, for clients such as Network Rail). There is also a moderate number of overseas naval trainees, particularly from Gulf countries.

We were shown several of the workshops, including those used for building skill of hand (carpentry, joinery, repair of composites (once known as GRP), and welding). We heard how difficult it is to achieve the right balance of "just in case" skills for use at sea when some, such as welding of modern materials, require frequent expensive requalification. We also had a practical demonstration of teaching of the theory of flight alongside a historic set of jet engines, including early German World War 2 models, and various helicopters used for training in fault finding and repair.

Over lunch, we met several engineering students and staff, including aspiring officer candidates, and heard how deeply involved the Navy and Royal Marines (as part of the Navy) are in supporting the UK's work in Afghanistan. We also experienced some traditional steam technology in the form of a ride in Steam Sentinel, a steam-powered lorry that has taken part in a past Lord Mayor's Show.



*Linda Brooks before embarking on the Steam Powered Lorry the Super Sentinel*

Overall, we received the Navy's traditional first-class hospitality, a valuable insight into the engineering training side of the Navy, and an invaluable means of reinforcing our Company's links. We will be given longer notice of future years' Affiliation Days so that more Liveryman can share this experience!

*Barry Brooks*

## **ANNUAL LIVERY BANQUET** **29<sup>th</sup> October 2010**

The annual Banquet is considered by most to be the social highlight of the Company the year, and as I climbed the stairs to the Salon of the Mansion House I remembered why. The setting – in this outstanding Georgian Palace in the centre of the City – is magnificent. Add to that several hundred people in their finest attire, a brass quintet and a few glasses of champagne ... a recipe for success.

After being greeted by the Master Mr John Robinson and the Wardens and their partners, members and their guests were able to admire the many statues and paintings in the Salon and the Drawing rooms while meeting new or renewing old acquaintances. Then into the Great Egyptian Hall for dinner. There is, incidentally, nothing Egyptian about the Hall. The statues are Romanesque and the architecture Classical. The name probably derives from inspiration taken from temple buildings in Egypt built by the Roman architect Vitruvius. With 200 people inside it became less intimidating, as we applauded the top table to their places, led by Beadle Stephen Grundy bearing aloft the Company Sword.



*The Master, Wardens and Ladies ready to meet the Guests*

Official guests included Masters of the Pavors, Founders, Actuaries, Turners, Armourers and Brasiers, Chartered Surveyors, Wax Chandlers and Environmental Cleaners, and their partners. We also enjoyed the company of the Master and Mistress Cutler of Hallamshire who had travelled from Sheffield. It was particularly pleasing to see Lady Gadsden too.



*The Master, John Robinson and his Wife, Doreen, at the Mansion House*

The meal did not disappoint: hot salmon being chased along by a loin of venison, in turn gently cosseted by a lemongrass panacotta. At least we now know what happened to the

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Emperor of Exmoor – and he was delicious. The singing of grace was well up to the normal standard (relatively few sensitive musical guests fainted), and the Middle Warden was observed proudly not reading the words. Clearly someone who remembers John Redwood.

As is traditional, the Loving Cup was circulated before the speeches. I have always thought the procedure falls into the category of those things easier to do than describe - which the anxious muttering of guests beforehand tends to confirm. However, no-one seemed to have been stabbed in the back, so it must have been successful this time.

The Master spoke of the three Cites: civic, financial and business, and how they are interdependent. He gave a hard-hitting critique of recent financial practice, reminding us that business is required to remain honest and retain the trust of clients, investors, workers and the public. Finally touching on the role of the engineer in innovation, and the importance of funding science, he proposed the toast to the Lord Mayor and Corporation.



*Lord Mayor Locum Tenens Sir John Stuttard*

Responding, Alderman Sir John Stuttard (above) apologised for the absence of the Lord Mayor who was furthering British business interests in India. He had good reason personally to be proud of British engineering, having once driven a Rolls Royce from Peking to Paris without a hitch. Referring to the recent financial crisis, he avowed that many banks had behaved honourably, but said that the tiny minority who did not must be eradicated. One startling statistic was that the tax taken from banks is capable of funding the whole NHS on its own. He was proud of the contribution that the Livery makes to upholding values and standards in business.

After Junior Warden Air Vice-Marshal Graham Skinner had proposed the toast to our guests, Professor William Bonfield responded. Asserting that engineering was in good heart, he drew attention to the technology used in the recent Chilean

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mine rescue. Professor Bonfield (left) went on to describe the progress of developments in his own field from hip replacements to the engineering of bone and tissue, concluding that British engineering could remain the best in the world, provided we protect our universities. He concluded by proposing the toast to the Company.

All-in-all this was yet another an excellent

Annual Banquet, for which we must thank our Clerk Tony Willenbruch and Assistant Clerk Stephen Grundy for the organisation, and The Lord Mayor for his hospitality.

*John Crackett*

## *The Master's Speech*

Wardens, My Lord Mayor, My Lord, Sheriffs, Ladies and Gentlemen,

It is my great pleasure to welcome you all to the Mansion House. I particularly welcome Alderman Sir John Stuttard and Lady Stuttard. Sir John is a past Lord Mayor who is standing in while the Lord Mayor is away on an official visit and is also this years Master Glazier. We also particularly welcome the Sheriffs together with their Ladies. I welcome all the Company's guests and Doreen joins me in welcoming our personal guests and our Liverymen and their guests.

It is a huge privilege to hold our Annual Banquet in this magnificent House, with its rich history. We are grateful to all those who have prepared and served this wonderful meal. I never cease to admire the skill in preparing food on such large scale, and the military precision of the whole event. We thank you all. We are again grateful to the 'Live Brass' Quintet for their fine music. I am particularly grateful to Wing Commander Tony Willenbruch, our Learned Clerk, and Steve Grundy, our Assistant Clerk and Beadle. They do all the work in organising the Banquet, and a huge task it is too! Please join me in showing our appreciation to all of them.

These are difficult times. We have just had the Spending Review. There is general agreement on the need to substantially tighten, but real concern about fairness. Business is nervous, unemployment is certain to rise, and many people who already face difficult circumstances will see their position become even more difficult. We are in for a number of tough years which does require people to pull together, but will test our unity. The Lord Mayor has the important international role of representing the City and Financial Services, in these difficult circumstances

There are three “Cities”. There is the Civic City – of which we, as Livery Company, are a part. There is the Financial City, banks, lawyers, accountants and other services. And there is the Business City. I have spent much of my life in the Business City – being Chief Executive of one FTSE 100 Company, and Chairman of three. And latterly, also in the Financial City, being a Partner in a Private Equity firm. All three Cities are interdependent, and need each other. Business cannot operate without money and advice, and the Financial City ultimately gets its income from business.

The world is now a very different place from even 5 years ago. Huge debts built up by nations and individuals have to be faced. Financial and political power is moving from the United States to Asia. This is a Global Crisis, but only the blinkered would argue that we ourselves were not a substantial part of the cause. And yet in the City, we seem to be reverting to old habits, old ways, pretending nothing has changed – even some again expressing pride in its standards of honesty and integrity, which nobody outside its own tight confines will do anything but laugh hollowly.



*The Master, John Robinson*

Business depends on trust and honesty. In the long run, to be successful, we must have the trust and respect of our clients, investors, employees and the public. But have we? Can public companies prosper when a FTSE share register now turns over annually? What about shareholder responsibility? Should people like Hedge Funds be able to force a takeover, with no concern as shareholders for the business itself? Should banks pay massive bonuses, which relate neither to the good of the client, or the bank? Can we continue to have huge non-negotiable underwriting fees, when there is virtually no risk? Why do share prices so often move ahead of deals? Why do advisory fees often not relate to the time and effort involved? Why does the Financial City believe that it has an ongoing right to pay itself substantially more than every other sector of the economy? And why do business leaders think that their remuneration can continue to rise when so many others are falling? All these are important issues to face. They will not go away. Regulation is important – but the fundamentals must be right first. Until we face up to some of these realities, the Lord Mayor has his work cut out.

What about us Engineers? Well, many of us can exert our influence on these things, and we must. But in the end, wealth and prosperity comes from creating and selling new products and services which add real value. Businesses which do not innovate, but do the same old things in the same old way, decline. Businesses which create new products which satisfy real need, prosper. I have been lucky to spend most of my career in the medical device industry, which continually has to re-invent itself because of the rate of the increase of knowledge. There are virtually no products remaining in Smith and Nephew from when I joined. The business is based on understanding the science of bone and tissue growth better than anybody else in the world – and developing products based on that knowledge. It needs investment in Research and Development at high levels, consistently, over succeeding years. The share price has increased almost twenty times. This is real wealth creation. Like any company quoted in London, it needs the finance and services the City provides. Global businesses can be based anywhere. They will stay in London only so long as they believe it is best for their business. A few have already moved out.

All this is why I believe the science base is so fundamental to this country’s future. It creates the foundation for a business and an anchor to keep people here. I was particularly pleased that the government has largely protected science funding in the Spending review. Britain is second in the world on most measures for quality and volume of science. We outperform substantially! So we have a sound base – but we must use it. That is what Engineers do!

Professor Bonfield, our principal guest, is an academic who makes things happen. Bill is a member of the small group who are members of the academic “trinity”; a Fellow of the Royal Society, the Royal Academy of Engineering, and the Academy of Medical Sciences. A world leader in his field in medical materials, he has always been engaged with industry in helping to ensure that science becomes products. He was a valued member of our Scientific Advisory Board at Smith & Nephew. Bill has created a number of start up businesses. One of them, ApaTech, sold for \$300 million in a cash deal this year. That is wealth creation. His engineering is small scale, at the interface between biology, medicine, chemistry and engineering. The clever stuff is often so small you cannot see it. A man of many parts, also a cyclist who raced at the highest level

We have much to be grateful to our leaders in the City. Alderman Nick Anstee has been a great representative for us, has given of himself unstintingly, and we wish him well as he comes to the end of his year as Lord Mayor. Of course Alderman Michael Bear, one of our Liverymen, will shortly succeed him. Sheriffs Fiona Woolf and Richard Sermon are at the beginning of their year of office. We wish them well and thank them for all their efforts so far. Theirs has never been a more important role.

Would you please all join me in the Civic Toast to the Lord Mayor, the City of London Corporation and the Sheriffs?

*Mansion House Pictures courtesy Gerald Sharp*



## **COMPANY NEWS** **July Court Meeting**

## **Assistant Alderman Michael Bear BSc, MBA, FICE**

*The first item of business at the Court Meeting on 6th July was to invest those members of the Court who were elected at Common Hall in April but who were unable to be present at that meeting. These were*

### **Assistant Air Vice Marshal Graham Skinner CBE, RAF, FIMechE, FCILT, FRAeS**



*At the end of the Court Meeting five new Liverymen were invested*

### **Professor Maria Petrou FREng, DSc, PhD, BSc, CEng, FIET**

### **Assistant John Baxter FREng, FRSE, FIMechE, FIET, FImarEST**



Following her first degree in Mathematics and a PhD at Cambridge, Maria lectured in Athens before undertaking post-doctoral work in Oxford, Reading and at the Rutherford-Appleton laboratory. Rising from lecturer to a professorship at Surrey University, Maria went on to become Professor of Signal Processing at Imperial College London and Director of the Informatics and Telematics Institute in

Thassaloniki, Greece. Her principal interests include image processing and computer vision. In addition to her PhD, Maria holds a Doctorate of Science and is a Fellow of the Royal Academy of Engineering.

### **Mrs Suzanne Gramina Flynn BSc(Eng), CEng, ACGI, FIET, MCQI, CQP, FIES, FRSA**

After a few years as an RAF engineering officer, a brief period working in the Low Countries followed by a career break, Suzanne spent a couple of years with Marconi Defence Systems in the late 80's then worked firstly with



Scomag Ltd followed by Real Time Engineering Ltd up to 1995. From then on she has been part owner and director of Cygnet Solutions specializing in software quality and testing, control and instrumentation and safety-related systems. Suzanne is a Fellow of the Institution of Engineering and Technology and also of the Institute of Engineers and Shipbuilders in Scotland.

**Eur Ing David Arthur Cooke BSc(Eng), CEng, FIChemE, FIMarEST**



David has spent some 36 years in the provision of upstream oil and gas development facilities, primarily offshore with functions ranging from conceptual studies to construction management. He has worked for operators and contractors and is now an independent consultant.

Geographically, his main areas of work have been in the South, the South-East and both the Far East Asia and West Africa. His principal interests are upstream oil and gas production including subsea technology, fixed installations, pipelines and floating production systems. David holds Fellowships of the Institution of Chemical Engineers and the Institute of Marine Engineering, Science and Technology.

**Eur Ing Dr Alan Ernest Kinnaird Holbrook MA, PhD, CEng, FIMechE**



With a first degree in Engineering Science from Oxford and a PhD from Cranfield, Alan spent the early 80's with Instron Ltd on the development of servo-hydraulic and temperature control equipment moving on to spend the last 22 years with Edwards Ltd on the development of vacuum

pumps and technical information systems. He is now the Technical Section Leader on new product introduction. His principal interests lie in engineering management, in particular technology development and the conceptual design phase, concept selection, dimensional management

and tolerance analysis. Alan is a Fellow of the Institution of Mechanical Engineers.

**Eur Ing Dr Alastair Faulkner MSc, EngD, CEng, FBCS, MIET, CITP**



With 25 years experience, the last 10 as a Principal Consultant, Alastair has filled senior roles supporting the delivery of large UK infrastructure projects including the East London Line and Crossrail. His principal interests include the use of data within complex systems including process and data supply chains. He is a Doctor of Engineering and Fellow of the British Computer Society.

**October Court Meeting**

*We were very pleased to welcome HRH the Duke of Kent to the dinner after the Court Meeting on 12th October. We were also pleased to welcome two of our Award Winners who were unable to be present at the Awards Dinner in July and the Duke assisted the Master in presenting the Awards. Their photographs and citations are in the report on the Awards Dinner.*



*The Master John Robinson and HRH The Duke of Kent KG, GCMG, GCVO*

*At the Court Meeting one new Liveryman was invested and we welcomed*

## Dr Nigel John Burton BSc(Eng), PhD, CEng, FIET



Nigel Burton has just been elected President of the Institution of Engineering and Technology and is currently Chief Financial Officer of Advanced Power AG, a power station development company. After Graduating from University College London Nigel studied for a doctorate in acoustic microscopy also at UCL. After an early career in engineering at British Rail

and as a project manager with VG Semicon he moved to the banking sector as a Technology Investment Analyst with Robert Fleming following which he was Head of Utilities at UBS Warburg and then Deutsche Bank. He then became Chief Financial Officer of WI Link, an on line information service and Finance Director of Granby Oil and Gas plc before taking on his current role in 2008.

## Members' News

Congratulations to Court Assistant Alderman Michael Bear on being elected as Lord Mayor and taking office at the Silent Ceremony on 12th November followed by the procession through the streets of London to the Law Courts on 13th November. There will be a report on the Procession in the next edition of the Swordsman.

We congratulate Assistant Jean Venables and Liveryman Doug Oakervee on being made CBEs in The Queen's Birthday honours list. We also congratulate Liverman Denis Filer's wife Pamela on being made an MBE



*Pam Filer, at the Awards Dinner, wearing the MBE insignia for the first time*

We are pleased to record the Liveryman Gordon Masterton was made Chairman of the Construction Industry Council on 10th June. The CIC is the most important representative forum for the professional bodies, research organisations and specialist business associations in the construction industry.

We are very sorry to report the death of Liveryman Rear Admiral Tony Monk in July at the age of 86 and our sympathy is extended to Elizabeth and her family.

Liveryman Alan Grant has written to report that he and Alec Osborn have just been to visit Ken Slater, a Liveryman since 1992, who is now a resident at Cedar Falls Care Home, Little London Road, Spalding, Lincs., PE11 2UA. Ken is well, and pretty cheerful, but misses his many friends in the London area. Ken has his own private phone line, 01775 713545, and would welcome a call, or a visit from any engineers and friends who may be in the area.

## Legacy for the Charitable Trust

Following the sad death of the Company's second Master Sir Denis Rooke we are very pleased to acknowledge with grateful thanks the bequest of £50,000 to the Company's Charitable Trust. The Trust is always extremely appreciative of legacies such as this and if you think that you can help in this way further information is available from the Clerk.

## RAF Benevolent Fund

Assistant Emeritus Ken Fergusson has told me that his daughter Helen was exploring their land near Hoveringham with a metal detector and found some parts of two Lancaster Bombers. After a year of research she discovered that the planes had crashed within a fortnight of each other on their final approach to RAF Syerton. Helen has contacted relatives of the crews and a permanent memorial has been established. Helen has also written a book called 'The Courage of the Small Hours' about the events with all profits going to the RAF Benevolent Fund and the Bomber Command Memorial Appeal. If you would like to support this copies may be ordered from Helen Nall at Hoveringham Hall, Hoveringham, Notts, NG14 7JR for £12.50 including p&p

On a similar note the Company's August newsletter told us about a gala dinner to be held at the RAF Museum at Cosford on 11<sup>th</sup> September. Members will probably remember the museum from our visit there during the last Ironbridge weekend. The dinner was to commemorate the Battle of Britain and to raise funds for the RAF Benevolent Fund. I think that at least twelve people came from the Company though not all in one party.

We arrived at the entrance to the museum and went through to the champagne reception in hangars 2 and 3 which are full of fascinating aircraft from the days when experimental planes were produced in great profusion and remarkably quickly. This is not the place to describe the aircraft in detail but to anyone with an interest in aircraft this is a

completely exceptional display. We then moved out from the hangars on a lovely warm sunny evening for the Sunset Ceremony. The salute was taken by Air Commodore C.H.Green, Commandant of the Defence College of Aeronautical Engineering and Station Commander RAF Cosford. The parade was up to the expected standard but the highlight – in every sense - was quite unexpected. At precisely the right moment as the Commandant was taking the salute, a flight of geese in perfect formation passed directly overhead. I knew that this was going to be a very well planned evening but I had not quite anticipated this level of perfection.



*Ted and Sally in Chatham in April 2005*



*A Meteor in the Cold War Museum during the Company's Visit in 2008*

We then went into the new National Cold War Exhibition Gallery. Again there are many fascinating aircraft and in particular there are examples of all three of the RAF V bombers, Valiant, Victor and Vulcan. The tables for dinner were set under the wings of these of the great bombers. It was a quite exceptional occasion and a privilege to dine there. The after dinner speech was by Wing Commander Andy Green who is the world land speed record holder and a fighter pilot. He made a fine speech explaining how the current supersonic record bid is being used to inspire schoolchildren to take an interest in engineering.



*Tony and Naemi at Castle Howard in September*

The evening should have raised a goodly sum for the RAF Benevolent Fund and what better cause at this anniversary time.

*Brian Cook*



*John and Rita also at Castle Howard*

### **GOLDEN WEDDINGS**

Three liverymen celebrated their Golden Wedding Anniversaries in the summer and many congratulations to Past Master Emeritus Ted and Sally Willmott, Assistant Emeritus Tony and Naemi Best, and to John and Rita Hanford.

I have been asked to draw Liverymen's attention to the facilities offered by the Butchers and Ironmongers Companies. Both Companies offer luncheon in their Halls at reasonable prices; the Ironmongers on Mondays and the Butchers on Wednesdays. I do not believe it is necessary to book.

*Editor*

**Finally the Master, Wardens and editor wish you all a very happy Christmas and prosperous New Year'.**