



**The UK Space Conference**  
**The SARTHE Report**

“I want to see a UK Space Community that’s at the forefront of Space exploration, as well as a growth of highly skilled, creative people working together on space systems. It really is I think part of our future, and critical to national infrastructure.”

**Ian Pearson, Minister for Science and innovation**

“Space really matters.”

**Lord Sainsbury**

The inspirational value of the space program is probably of far greater importance to education than any input of dollars ... A whole generation is growing up which has been attracted to the hard disciplines of science and engineering by the romance of space.

**Arthur C. Clarke**

# **Executive Summary**

**A UK Space Conference will be held at the prestigious Charterhouse School in March 2008.**

**The conclusions of the SARTHE Symposium are as follows:**

- The United Kingdom Space Conference should emphasise Networking, Education and Outreach.
- A wide variety of groups should be invited to come together to create the conference. In doing so we are creating a network. This is a network that is not constrained by a need for consensus but rather of affiliation, a sharing of an event that reflects the wide variety of achievement and concerns within the UK Space community. A network that will be further enabled by the conference as a meeting place.
- The conference should deliberately set out to be inclusive and to be unashamedly populist.
- United Kingdom Space Groups should be invited to join in the planning of the conference through a Steering Group.
- Further appealing to the largest possible audience should not lead to any ‘dumbing down’ and that a Scientific Organising Committee should be set up to ensure that all contributions are of sufficient calibre.
- The conference will also be an opportunity for the UK Space Community to have a platform to speak to a wider audience. It was further argued by David Boyce and Duncan Law-Green of Leicester University that the conference should embrace podcasts, blogs, Facebook and a number of other forums created by young people and the new media. This will result in the creation of a virtual conference in parallel to the physical one, greatly increasing its electronic footprint.
- The virtual conference will reach a much wider audience and should be given a high priority in the planning of the conference. This virtual initiative would inform both the general public and the media.

**The benefits of a UK Space Conference at Charterhouse**

- A full range of space-related topics and activities, including:
  - Space science and exploration
  - History
  - Education
  - Rocketry
- An outstanding location, boasting lecture facilities, meeting rooms, accommodation and catering, all on site.
- Extremely attractive attendance rates

**We invite you to join us in this venture.**

# A UK SPACE CONFERENCE

## Introduction

For the last nine years the British Rocketry Oral History Programme has held conferences at Charterhouse School in Surrey. Over the years, the conference has evolved into to an event lasting 3 days and attracting nearly 400 people. Its subject matter has also grown and now encompasses all aspects of aspects of space, including research and exploration,

In view of the continued evolution of the conference, it has been proposed that it should become “The UK Space Conference”, to recognise its de facto status. The SARTHE group therefore met for a week in order to discuss the future of the conference and what it can do to benefit the UK space community. This report is the result of our discussions and deliberations. It also includes submissions from others who were unable to attend the SARTHE symposium but who wished to contribute.

We believe that a UK Space Conference focusing on Education, Outreach and Space Technology can offer a great deal, not just to the UK Space Community, but also to the wider community as well. There is a desperate need to inspire our young people and to inform the general public. The conference will showcase current and future projects, activities and past achievement. It will provide a lively mix of generations and formats with formal presentations, panel discussions as well as exhibitions, rocketry competitions, INSET training for teachers and – most importantly – an opportunity for anyone with an interest in space, professional or personal, to meet.

This is an exciting development, but it needs the involvement of a wide range of people and organisations to make it happen, and to make it a success. **We invite you to join us.**

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# Foreword by Reg Turnill

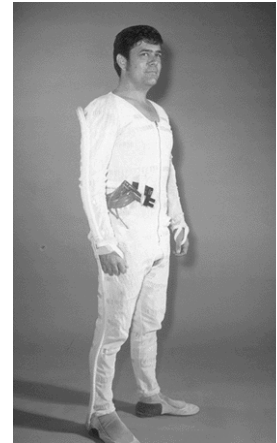
Plans for a United Kingdom Space Conference are both welcome and timely.

Since human spaceflight began with Yuri Gagarin's one-orbit flight on 12 April 1961 every major nation has been eager to participate in this ultimate form of exploration -- except Britain. For almost 50 years successive Governments have regularly endorsed the policy first recommended by Professor Harrie Massey to Prime Minister Macmillan that Britain's participation in space should be by 'instruments automatically operated'. It has been supported by the scientific community because they feared that a change would divert funds from their very successful unmanned space activities.

Some of the best and brightest of our innovative scientists have gone abroad. John Hodge, was welcomed by the newly-created NASA when starting their manned spaceflight programme, and as a Flight Director played a major part in orbiting the first US astronauts. It is astonishing how much Britain has contributed. Two examples are the liquid-cooled garments that enable astronauts to survive on the lunar surface, and the fuel cells providing NASA's spacecraft with power and water during their journeys.

For decades we have watched other European countries celebrating missions by their nationals to the Soviet Mir space station and in Soyuz spacecraft and the Space Shuttle to the International Space Station. Our universities have been shutting down their mathematics and physics departments because of lack of interest and enthusiasm among our students. They see few job prospects to reward them if they master these most difficult subjects. A greater investment in space-based technology and in Human Spaceflight might help change this state of affairs.

At last there are signs of a political change, with the realisation that there is a desperate need for Britain to start running if it is to catch up with the rest of the world. A national space conference, held annually at different venues around the United Kingdom, should do much to accelerate the process.



The liquid cooled undergarment worn by astronauts on the Moon.

## Reginald Turnill



Reg Turnill is the world's longest serving aerospace correspondent. He covered US manned spaceflights from Cape Canaveral right from Alan Shepard's Mercury flight in 1961.

He also acted as space reporter on programmes such as the young person's news service "Newsround".



# **The Future of the UK Space Community**

**13 - 20th October 2007**

**Symposium**

**Aerospace**

**Research**

**Technology**

**History**

**Education**

## **The SARTHE Report**

In a week of intensive discussion on 'The Future of the United Kingdom Space Community', the SARTHE group achieved a remarkable degree of agreement despite the wide range of age and backgrounds represented. There was a consensus that an annual United Kingdom Space Conference would be a valuable initiative and that the SARTHE group should take the lead in creating such a conference.

There was unanimity amongst the group as to the importance of Space in the national life of the United Kingdom. Space affects everyone in the United Kingdom and the future prosperity and well-being of this country will be affected by the exploitation of Space. Yet space is not merely about the future - it affects us all now. It may be when we look up at the stars and wonder at the immensity of space or more prosaically when we log on to the net or watch television. Space can engage our passions, whether it is pride at human achievement, humility at our insignificant size in the face of such vastness or a determination to know more and achieve more. Space intrigues and challenges some of our best scientists and engineers, whether working in industry or space related research. But perhaps most important of all it inspires our young people. Therefore we believe that it is important that the United Kingdom Space Community plays a significant role in the scientific and cultural life of the country out of proportion to its size.

Our examination of the United Kingdom Space Community swiftly revealed an incredibly diverse community. There are those who earn a living from their involvement with space and those who pursue their interest in their own time and at their own expense. However, we must not dismiss the 'enthusiasts' since, for instance, amateur astronomers have made immense contributions to our knowledge of the universe. Furthermore gifted amateurs probably make a greater contribution to spreading knowledge and inspiring of the next generation than do many professionals. There are further divisions amongst the community between researchers, usually based in academic institutions and those working in Industry. Those in Academia and Industry cover a wide range of subjects and communication and collaboration tends to be limited to those within clearly defined disciplines.

The SARTHE group accepts the argument by Andrew Newsam of the National Schools Observatory that the general public is less interested in these sub-divisions and therefore that Outreach and Education efforts would be much more effective if there was more collaboration and co-operation within the United Kingdom Space Community. We believe that making the general public and in particular children more aware of Space is important. We would all be enriched by that knowledge and there would be significant gains for the United Kingdom in terms of educational achievement, economic progress and cultural enrichment.

We therefore believe that a conference bringing the United Kingdom Space Community together with an emphasis on Education, Outreach and Networking would be a powerful catalyst enabling further collaboration. We note the ESERO plus initiative being developed by Yorkshire Forward, ESA and BNSC, which we believe could be immensely valuable.

Alex Blustin and Lucie Green argue in the Mullard Space Science Laboratory submission that the networking possibilities created by such a conference would be immensely useful to professionals. Interdisciplinary networking between academics and between Industry and academia could have significant pay offs for the United Kingdom.

### **Conclusion**

The Symposium brought together individuals with a wide variety of backgrounds and ages. They included students and individuals from Academia, Industry, Education and the Media. In intensive discussions the group agreed that Space had a significant role to play in the life of the United Kingdom. It was also agreed that the UK Space community was fractured and splintered with a sad lack of communication or collaboration.

This led to the conclusion that a United Kingdom Space Conference was an appropriate vehicle to bring about greater collaboration.

# The UK Space Industry

Discussions at SARTHE about the UK Space Industry tended to be ambivalent. There was considerable pride at the achievements of industry and those who worked in it. However, there was concern that UK and in particular government might be under investing in space technology. The section that follows has a degree of schizophrenia. It incorporates both optimism about the capability and excellence of the UK Space Industry and about the new opportunities which are emerging and concern about future UK government investment. The Case for Space [1] was generally acknowledged to have produced a compelling argument for a much larger investment in UK Space technology and the economic and educational benefits for that would accrue.

## Upstream and Downstream

The UK space industry has been classified in terms of “upstream” and “downstream”, with the former being defined as activities directly related to spaceflight systems and the latter defined as exploiters, or users, of data acquired from space systems, and financial services related to them. The turnover of the upstream sector in the UK was £725 million in 2004-5, in comparison with a downstream turnover of £4.1 billion. The combined figure represents about 0.2% of UK GDP.

It is important to recognise that some of the downstream sector could prosper in the UK even if there was no indigenous investment or involvement in spaceflight activities. For example, industries could still market direct broadcast services from foreign or internationally owned satellites, and Earth observation service industries could still provide added value services in data processing and interpretation. However, the Case for Space gives powerful support to the argument that investment upstream is a powerful catalyst to growth in the downstream sector. Further there is evidence of a multiplier effect with upstream investment producing much larger economic payoffs both downstream and in the rest of the economy.

## Satellite manufacture

It is therefore important to look closely at that part of the industry that has direct involvement in spaceflight systems both as an important industry in its own right but also as a catalyst for downstream development. The history of the UK investment in Space technology has been uneven. During the late 1950s and the 1960s the UK made significant investments in launchers. There has been little involvement in launchers or other space infrastructure since 1971. However, the expertise and infrastructure built to support predominantly military projects did not disappear with the cancellation of most of these projects in the 1960s. There was subsequently further investment in communications satellites, Earth observation and scientific probes. The government investment in satellite technology in the 1970s and the earlier investment in launchers reaped technological and economic rewards. Charles Martin, an engineer who played a significant role in the development of the UK satellite business, argued that this success was based on the skills and experience gained during the development of launchers.

The UK Space Industry – primarily British Aerospace and Marconi – became world class in designing and manufacturing military and civil communications satellites. This success upstream created even greater opportunities downstream. However, in the 1990s it became apparent across Europe that these predominately national space companies were not securing sufficient business vs. their larger US rivals and so a process of consolidation took place. This has now culminated with two main “European prime contractors” (Thales Alenia - with Alcatel - and EADS Astrium). In this process Marconi Space Systems and Matra Espace merged into Matra Marconi Space which then bought BAe Space Systems. They are now all incorporated into EADS Astrium.

## Astrium Ltd.

Astrium Ltd is the UK arm of EADS Astrium, a global space industry leader with extensive prime contractorship experience and an international reputation for excellence across all sectors of the space business. Its activities include satellite systems, payloads and equipment for all civil and military applications from science and Earth observation to communications and navigation, a complete array



of launch capabilities, orbital systems and manned space missions, and a wide portfolio of innovative space-based services. EADS Astrium is a wholly-owned subsidiary of EADS, the European Aeronautic Defence and Space Company, In 2006 EADS Astrium had a turnover of €3.2 billion and employed over 11,000 people in France, Germany, the UK, Spain and the Netherlands.

Astrium Ltd with a turnover of over £500 million and 2,500 employees on its sites in Portsmouth, Stevenage and Poynton is in effect, 60% of the UK's upstream business, It has continued to build on its core competences, covering military communications, telecommunications payloads, antennas and digital processors, microwave equipment, space-borne radars and navigational payloads. One of its major responsibilities is the design and manufacture of the commercial Eurostar E3000 spacecraft platform and the complete communications or broadcasting payloads. The most powerful of broadcast satellites, HotBird 8 and the largest of all communications satellites, Inmarsat 4, with the most advanced digital signal processor, are already launched and fully operational as are two of the three Skynet 5 military communications spacecraft for which Astrium Ltd. is prime contractor.

As well as being prime contractor for the Skynet 5 satellites, Astrium, through its UK-based subsidiary Paradigm Secure Communications, is also the owner and operator of the MOD's Skynet military satellite communications system. Worth some £3.6 billion through to 2020, this service provision contract was, for the first time ever, procured under a Privately Funded Initiative(PFI).

More recently Astrium Ltd. with London-based Inmarsat has raised £36 million funding from the three Regional Development Agencies in the South East of England to allow participation in ESA's Alphasat next generation telecommunications satellite programme. Astrium will now develop the advanced payload, processor and antenna for Inmarsat's next generation spacecraft.

As a world leader in space-borne radar Astrium Ltd. has provided complete systems for ESA's European Remote Sensing satellites and the huge Envisat spacecraft for which it was also prime contractor. More recently it has supplied core elements into the Canadian Radarsat 2 programme and is developing, with its partner SSTL, a new lightweight radar satellite, AstroSAR-Lite, based on its Snapdragon concept. In Earth observation it is also prime contractor for ESA's Aeolus wind sensing satellite which will revolutionise the way we monitor and predict our rapidly changing weather patterns over the next few years.

In satellite navigation Astrium Ltd has built on its past experience in developing navigation payloads for the Inmarsat 3 and Inmarsat 4 spacecraft and is now providing the complete payload for the first four In-Orbit Validation satellites in Europe's 30 satellite Galileo constellation.

In science missions Astrium Ltd. is considered to be a key European player, being involved in almost every ESA programme. It was prime contractor for the Rosetta satellite, which is due to orbit Comet Churyumov Gerasimenko in 2014, and it has provided systems and instruments, including the Beagle 2 Mars Lander, into the Mars Express and Venus Express missions. More recently it has been selected by ESA as prime contractor on the 'gravity wave' LISA Pathfinder spacecraft and the platform for Gaia star mapper. It plays a key role in the European contribution to the Bepi-Colombo mission to Mercury and is responsible for the design and build of the Mid Infra-Red instrument in the huge NASA/ESA James Webb Space Telescope. Astrium Ltd has also benefited from its experience as industrial prime of the Beagle 2 Mars Lander and is now responsible for the design and development of the ExoMars Rover vehicle, a significant part of ESA's Aurora planetary exploration programme.

## **Upstream Industry**

In order to participate in ESA missions above Astrium and its UK partners and sub-contractors rely almost 100% on the 'juste retour' generated by the investment made by the UK Government, mission by mission. Failure to match the investment in space based technology made by her European partners can result in both the loss of work in the UK and in the longer term the loss of key technologies and competences here in the UK.

However UK Space is not just about hardware prime contractors. For over 20 years UK system software houses such as LogicaCMG, SciSys and Vega have been at the heart of ESA's ground

segment programme and have secured over 70% of these contracts. European weather data is received and processed by these systems and telecommunication service operators owe some of their efficiency to UK software products. Indeed it is not just ground systems that benefit. Today UK software can also be found on-board many telecommunications and research satellites around the world.

The other small and medium sized companies involved in space manufacturing specialise in niche products. Of particular interest is the small satellite business, which has been targeted at satellites of a few hundred kg at most. The very successful MOSAIC programme has proven the effectiveness of carefully targeted government investment. Of particular interest is SSSL.

### **Surrey Satellite Technologies Limited**

Surrey Satellite Technologies Limited (SSSL) continues to push the envelope of what is possible with small satellite designs. The company's launch total now stands at 27 missions, and a further 13 satellites are currently under contract at different stages of development. These include the RapidEye constellation of five identical satellites, which will provide daily remote sensing access to any location on the globe; two further satellites for the existing Disaster Monitoring Constellation, and NigeriaSat-2, a high-resolution imaging mission on a very agile "next-generation" satellite platform. This satellite will have the ability to collect imagery of the Earth at 2.5 m resolution, and will be able to support in-pass stereo and area collection modes of operation.

Based on the ongoing success of the GIOVE-A programme, SSSL are developing a small satellite platform capable of operating in GEO orbit, and are also working on a contracted study to examine the feasibility of small satellite missions to the Moon. Nor is SSSL alone in being a success story.

Other UK industries specialise in signal processors, CCD's, power systems and other high technology products. Importantly these include spacecraft payloads - the observing systems themselves. UK suppliers are particularly strong in climate detection systems and these sensors play a key role in the monitoring of global warming.

Looking forward, the UK has made a significant mark in space exploration robotics and is shaping much of the future European thinking in this regard. Recent announcements in support of the Global Exploration Strategy emphasise the UK focus on such robotics and other cost effective, creative satellite technologies.

Nevertheless, industry is presently excluded from participation in two of the primary areas of direct space manufacturing, namely launchers and manned spaceflight, which constitute up to half of the worldwide space manufacturing industry. Recent announcements that manned spaceflight is being reviewed by BNSC as part of the Global Exploration programme is therefore encouraging.

### **Old Policies and New Technologies**

"The UK government is ready to provide seed-corn funding for indigenous launch vehicle development" according to Rob Coppinger [2]. This astonishing development indicates a willingness of the government to take a fresh look at old policies and new technologies.

The success of the X-prize in stimulating new thinking and private investment regarding launcher technology may well have prompted the UK government. The success of the X-Prize and Burt Rutan not only opens up the possibility of an entirely new industry but also of new approaches to getting into orbit. The cost of sub-orbital and orbital flights remains a technological and economic bottleneck to the exploitation of space based technology.

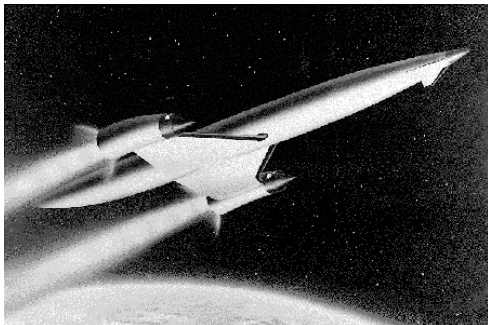
### **Space Tourism**

Richard Branson's investment in Virgin Galactic and the Spaceship One technology places the UK at the heart of global efforts to develop a Space Tourism industry regarded by many as wishful thinking even a few years before. Nor is the impact of these developments purely economic and technological. New thinking, new technology and a dynamic economy go hand in hand. The Bigelow Aerospace development of orbiting space stations [3] is another fascinating development that may well be a

catalyst for new thinking and new technological solutions in how to reach orbit. There is also the possibility of a thriving market for micro launchers as satellites become smaller and lighter.

Developments in micro electronics have meant satellites have become more capable, and more reliable whilst at the same time reducing in size and mass. Thus useful payloads can be launched with much smaller launch vehicles. There is one common element that runs through 50 years of spaceflight – the launching of payloads into space. At the height of the Cold War, in the 1960s and 1970s, most space launches were for military purposes. For example, the Soviet Union launched up to 100 spacecraft a year, mostly for reconnaissance. It may be estimated that roughly 1000 tonnes of payload was launched to Low Earth Orbit (LEO) every year. As another example of historical launch rates, the Apollo programme launched the equivalent of about 1000 tonnes to LEO, in order that 12 human beings could walk on the surface of the Moon. In recent times, however, the global figure for space launches has diminished to about 300 tonnes equivalent to LEO every year. This is mostly as a consequence of the end of the Cold War and improving technology resulting in lighter and longer life satellites. The current cost of launching payloads is, as a rough average, about \$10,000 per kg to LEO.

All space launch vehicles (with the exception of the partially reusable Space Shuttle) are expendable (ELVs). This means that they expend their spent stages in flight and require a complete re-build for the next flight. As the UK had become the only major industrialised nation without an indigenous launch capability, attempts have been made to initiate the development of revolutionary, reusable launch vehicles (RLVs). These would operate more like aircraft and fly to orbit, deliver a payload, then re-enter and recover to a runway landing, to be refuelled and fly again. It has long been speculated that such systems would reduce the cost of access to space by at least an order of magnitude. In the 1980s British Aerospace and Rolls Royce studied a Single Stage to Orbit (SSTO) RLV concept called HOTOL. This used a hybrid air-breathing / rocket engine to achieve a much improved payload fraction in comparison with a pure rocket powered SSTO, which had been found to be only marginally technically feasible. It was found that a 275 tonne take off mass vehicle could deliver a 7 tonne payload to orbit then return to Earth, land on a runway and be re-fuelled to fly again.



Reaction Engines “Skylon” spaceplane

Since that time ELV systems have serviced the market, although RLV research has continued in the UK with the Reaction Engines “Skylon” RLV programme. This has used the HOTOL R&D database and improved the vehicle and engine design, resulting in a vehicle with a 285 tonne take off mass and capable of delivering 12 tonnes to orbit. An engine test stand is being operated at the Reaction Engines base at AEA Culham, and ESA has indicated that it wishes to participate in the next phase of engine development. This is currently subject to negotiation, with a 10 million euro budget – a mixture of private and public (via ESA) contributions.

- [1] UK Space, The Case4Space Summary Report, EADS Space (2006) available at <http://case4space.com/>
- [2] Flight International, 5 November 2007, available at <http://www.flightglobal.com/articles/2007/11/05/219113/uk-ministries-of-defence-and-education-to-consider-funding.html>
- [3] Bigelow Aerospace: [http://www.bigelowaerospace.com/genesis\\_II/](http://www.bigelowaerospace.com/genesis_II/)

**Roger Longstaff**

# Academia

“We believe that space is a highly significant area of science policy. As other countries continue to explore and exploit space, it is crucial that the UK is also involved in this sector and it is necessary for the Government to take a more strategic approach to space”

**2007: A Space Policy:** Seventh Report of the Commons Select Committee on Science and Technology

Space science addresses some of the most fundamental of questions. How was the Universe, and the structures within it (galaxies, stars, planets) formed, and how will they evolve? How do changes in the Sun affect life on Earth? Is there life elsewhere in the Universe? Great progress is being made towards answering these questions, and to be able to contribute to this effort is a considerable privilege. With that privilege comes the responsibility to communicate; to engage with colleagues, industry partners, policymakers, and the general public, to convey just how important, exciting, and relevant space science developments are.

A UK space conference provides a suitable forum for such communication at a time when it is most relevant: the UK space science community is facing both great opportunities and serious challenges.

## UK Space Science

The United Kingdom's space science programme is truly world class. The UK is second only to the USA in the number of publications and citations produced in space science [1]. In open competition, UK scientists secured the highest utilisation of the joint NASA/ESA Hubble Space Telescope. UK researchers led two of the three instruments on the ESA XMM-Newton X-ray telescope, yielding peer-reviewed papers at the rate of one per day.

The UK space community is presently facing both great opportunities and severe challenges. Space research and development is very much on the international policy agenda, with new entrants such as China and India putting forward ambitious plans for unmanned and manned space programmes. The US is continuing with the 'Vision for Space Exploration', developing new spacecraft and systems for a manned return to the Moon around 2020, with possible follow-on missions to Mars. Such large projects can only be conducted in an international framework, and the UK can have a significant role to play. BNSC and NASA are already working together in a Joint Study Group on technical cooperation for lunar exploration [2]. ESA's Aurora exploration programme continues to progress, with the flagship ExoMars lander (which has a major UK input in the science instrument package) scheduled for a 2013 launch [3]. Other upcoming missions with significant UK input include the James Webb Space Telescope (JWST) - the successor to the Hubble Space Telescope, and the ESA GAIA mission, which will measure accurate positions, motions and spectral characteristics for up to one billion stars [4].

The recent Science and Technology Select Committee report "2007: A Space Policy" [1] highlighted the importance of space science for the UK's science base as a whole. It could be hoped that such a sympathetic hearing in government could lead to beneficial outcomes for the UK space science community, but what effect the Select Committee report will have on long term space policy remains to be seen. The BNSC's Civil Space Strategy for 2007-2010 is currently "in press" and expected to be published early in 2008.

In the meantime, the astronomy and space science community is being faced with the possibility of serious and unanticipated funding shortfalls. The results of the most recent Treasury Comprehensive Spending Review, coupled with the reorganisation of the previous funding/administrative bodies (PPARC and CCLRC) into the new Science and Technology Facilities Council (STFC) with responsibility for a number of new facilities, has left an estimated shortfall of about £80 million [5]. The consequences are already being felt with the proposed UK withdrawal from funding the Gemini 8-metre optical telescopes, world class facilities in which the UK has a 23% share [6]. Other serious and ongoing cuts seem inevitable unless the shortfall is restored.

The UK clearly needs an inclusive forum for debate of space science policies and priorities. A UK space conference provides such a forum.

### **The National Astronomy Meeting**

A UK space conference needs to demonstrate to the science community that it provides something of value that is not already addressed by existing events. The gold standard for UK space science meetings is the National Astronomy Meeting (NAM), a research conference on UK astronomy organised on an annual basis by the Royal Astronomical Society. Attempting to “compete” directly with, or otherwise displace NAM would be counterproductive, and highly likely to fail. The challenge for UKSC is to define what it will do, that NAM will not.

UKSC as currently described by the SARTHE Group authors is a broader event than NAM, less purely academic with much greater emphasis on involvement of industry and educational groups. UKSC will embrace space engineering R&D to a much greater extent via its industry links, and will actively target secondary students and undergraduates via activities such as the UKAYROC rocketry challenge, and a careers fair. If properly handled, this could be attractive to academics, particularly in the current circumstances where “traditional” sources of funding are under threat. Space scientists will be actively looking for new funding sources, such as (for example) the DIUS £100 million Collaborative Research and Development fund [7]. Grants for knowledge transfer and outreach projects will become more important than ever. Forging new interdisciplinary links is where UKSC can add real value to the academic community.

### **Planning the conference:**

The process of organising the academic component of a UK space conference is well established. Senior figures are approached to form the Scientific Organising Committee (SOC), which defines the scientific programme, appoints session chairmen and issues a Call for Papers covering a number of themes of interest. Academics then submit papers to the SOC, which then reviews them for scientific content, and assembles the session lecture and poster programme.

The relevant expertise can be readily assembled to form the scientific programme of a UK space conference.

### **J. Duncan Law-Green and David Boyce**

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#### **References:**

- [1] “2007: A Space Policy” – Seventh Report of the Commons Science & Technology Select Committee  
<http://www.publications.parliament.gov.uk/pa/cm200607/cmselect/cmsctech/66/6604.htm>
- [2] <http://www.flightglobal.com/articles/2007/11/13/219518/uk-argues-for-commercial-role-in-lunar-exploration.html>
- [3] <http://news.bbc.co.uk/1/hi/sci/tech/7093172.stm>
- [4] <http://www.esa.int/science/gaia>
- [5] <http://www.scitech.ac.uk/About/Strat/Council/CSRResp.aspx>
- [6] <http://www.astronomynow.com/news/071116gemini/>
- [7] <http://www.berr.gov.uk/innovation/technologystrategyboard/index.html>

# Education

## Why is it Important?

The SARTHE conference in October 2007 was very timely as far as space and education are concerned. This was because three very significant documents relating to the direction and funding of UK involvement in space were either recently produced or imminent at the time of the conference.

The first was the report of the investigation of the then Science and Technology Parliamentary Committee (now disbanded) entitled 2007: A Space Policy. [1] Secondly it coincided with the Government's triennial Comprehensive Spending Review, which sets the overall levels of spending for all aspects of Government activity - including of course space. Finally, early 2008 should see the publication by BNSC of the UK Space Strategy for 2007 – 2010.

One thing already clear within the context of these strategy and policy developments is that a much higher profile will be given to the application of space across education. It is generally believed, and specific studies have shown, that space has a key role to play in addressing the national concern to increase participation, attainment and retention in the STEM (science, technology, engineering and mathematics) subjects, though in itself this issue is part of a wider spectrum ranging at its narrowest to the need for specific skills within the space industries themselves through to the general need for an informed populace.

## What are the Key Issues and Developments?

As referred to above, there is across the UK (in common with many other countries) a concern that future economic competitiveness will be compromised by a shortage of specific scientific skills. Numbers of young people studying separate science subjects at GCSE are falling, with consequent reductions in A- and AS-level entries and recruitment into physical science subjects at university level. This then has obvious longer-term implications for careers within the STEM industries. Space can play a crucial role in capturing the imagination of young people inspiring and motivating them towards the STEM subjects. This contribution is probably unique to space.

Statistical evidence for the direct impact of space on uptake of STEM subjects is limited but still persuasive. The Education and Skills Case for Space [2] cites in particular the effect of the Scottish Space School on uptake of science at higher level and at university. It also refers to the reversal of the general trend in the decline in physics by those universities whose focus is on aerophysics or astrophysics. The testimony of several teachers, in some cases backed up by extensive individual evidence, in others anecdotal, also supports the case. Added to the written statements from students and from employees in the aerospace industry (including evidence from 500 members of the IMechE) a clear overall picture emerges – space inspires young people towards STEM subjects and careers.

The beneficial impact of space extends beyond the formal STEM curriculum to a wide range of learning environments and contexts including other curriculum areas such as art, music and religious education, out-of-school-hours activity, science clubs and enterprise days. It also extends to lifelong learning through numerous astronomy societies.

One issue of general concern is that of Careers Education, Advice and Guidance. The UK Space industry has such a low profile that even highly educated people are totally unaware of its existence, even though the industry is probably the most highly skilled and most productive (in GDP terms) sector in the UK, as evidenced in The Economic Case for Space [3]. Many people believe that to work in the space industry one would need to move to the United States; many young people can name only one career in the space industry, namely being an astronaut. It is hardly likely in this scenario that a young person interested in space would see potential career openings within the UK, or would find ready access to informed Careers advice and guidance.

Developments are in place to address some of these issues and to capture the power of space in a more systematic and coherent way than exists at present. ESA is establishing in four pilot countries an initiative called ESERO – the European Space Education Resource Office. Offices have already opened in The Netherlands, Belgium and Spain, and discussions are far advanced for ESERO-UK.



Business Planning for the ESERO-UK has been undertaken by Space Connections, a project within Yorkshire Forward, the Regional Development Agency for Yorkshire and the Humber region. The involvement of Yorkshire Forward arises from its desire to increase and improve STEM skills across this region.

ESERO-UK is envisaged as a network of key partners across England, Wales, Scotland and Northern Ireland. Its key purpose is to bring coherence and coordination to the applications of space resources across many learning environments, with a specific focus on professional development for teachers. Given the Government drive on STEM skills, it is important that the space dimension should be integrated within that and not achieved through some parallel structure. The plan is therefore to use the National Science Learning Centre, based at the University of York, as the hub of ESERO-UK, with spokes radiating from there to the other three UK nations and to the network of nine regional science learning centres. Individual providers of space education experience would then connect through these national or regional centres.

Although the ESERO initiative is welcome and necessary, it is not in itself sufficient. Teachers in general use resources from other agencies, particularly NASA, as well as those from ESA. Similar coherence is needed across these as well as across ESA-based resources. ESERO will then be a focal point for this wider coherence – a concept designated ESERO+

### **Who are the Key Players?**

One of the central achievements of SARTHE was the construction of a road map for UK Space. The education corner of this complex undertaking was both itself heavily populated with many players large and small, and also integrally linked to many of the other areas.

The agencies named as key players in space education included (in no particular order):

- BNSC and its related Government Departments DIUS and DCSF
- STEMNET
- SETPOINTS
- National and Regional Science Learning Centres
- Space Connections
- Space Education Council
- STFC (Science and Technologies Facilities Council)
- Scottish Careers
- Armagh Planetarium
- ISSET
- ASE (Association for Science Education)
- RDAs
- Sector Skills Councils

Added to these are a number of visitor attractions, of national, regional or local significance, including:

- The National Space Centre
- The National Science Museum
- Spaceport, Wirral
- Launceston, Cornwall
- Planetariums

Many of the above visitor attractions, as well as being open to the public, offer specific educational experiences to school groups and others. They are supplemented by a range of formal and informal providers of space-related education, institutional and individual, including:

- The STAR Centre (Keighley)
- Out of this World Learning (Jon London)
- Jerry Stone (Chair of the Space Education Council, and a freelance presenter on space exploration)

A number of organisations also use space as the basis for competitions and challenges, through which the inspirational value of space is harnessed. Such challenges include:

- UKAYROC (Tripolus, UKRA and Space Connections)
- Your Face in Space (Avanti)
- School Satellite Experiment (SSTL / BNSC)

### **How will it affect a UK Space Conference?**

It can be seen from the above that education is a ‘hot topic’ within the overall space debate. Its profile has never been higher, and within the forthcoming Space Strategy that raised profile is expected to be formalised. Any UK Space Conference which did not recognise the importance of the space-education axis would be missing a vital dimension.

Education will therefore affect the content and format of a UK Space Conference. A variety of formats could be used to cover a range of topics within an education parallel. As well as the usual presentations, the conference can include live demonstrations and discussion panels.

As well as featuring at the event itself, education topics lend themselves to the new opportunities for an ‘extended conference’, including podcasts, websites, blogs, webinars and Facebook groups.

To achieve the potential of the education parallel an action plan is urgently needed, covering the planning and preparation stages, the event itself and the online extensions of the conference.

### **Paul Spencer**

#### **Acknowledgement**

Thanks are expressed to all SARTHE conference colleagues for their informed and helpful contribution to the education debate.

#### **Bibliography**

- [1] House of Commons Science and Technology Committee; 2007, A Space Policy, (2007) available at <http://www.publications.parliament.uk/pa/cm200607/cmselect/cmsctech/66/66i.pdf>
- [2] Spencer, P and Hulbert, G, The Education and Skills Case for Space, BNSC, PPARC, EADS Astrium and Space Connections (2006) available at <http://www.spaceconnections.net/documents/caseforspace.pdf>
- [3] UK Space, The Case4Space Summary Report, EADS Space (2006) available at <http://case4space.com/>

## **Space and Astronomy Interventions in the Curriculum**

There is strong anecdotal evidence that children are excited and inspired by interventions in the curriculum using Space and Astronomy. Inspiring children to greater achievement has potentially great significance for the UK Education system and United Kingdom PLC (Future). In terms of the Social Inclusion agenda the possibility of inspiring young people who have low expectations of themselves and the possibility of Educational achievement is particularly exciting. There is a need to examine this evidence to demonstrate whether such interventions do make a significant difference to a child's education in terms of attitude, attainment or future specialisation.

There are many different types of intervention ranging from a visit to a visitor attraction such as the National Space Centre, the Science Museum, Spaceport or the Royal Observatory Greenwich, to visits from Astronauts or long-term interventions such as the National Schools Observatory. At Liverpool John Moores University we are particularly proud of the National Schools Observatory.

We believe that Astronomy and Space Exploration engage children in slightly different but synergistic ways. Astronomy has a WOW factor that places the child in the midst and of a dynamic and fantastic universe that challenges our understanding and encourages wonder. That we really are stardust encourages children to think about universe beyond the walls of their school and their community. Space exploration brings us a very human narrative of aspiration, of danger and death and the triumph of human beings in the face of overwhelming challenges.

The astronaut Major-General Charles Bolden visited Liverpool and visited schools with a simple message. "Study hard and don't let anyone tell you can't succeed." Charlie, as he insisted on being called by the children he met, had been denied educational opportunities in a segregated society in the United States in the fifties. He brought with his simple message the gravitas no teacher could aspire to. Here was a 'role model' untouched by the world of celebrity yet someone all the listening children immediately respected. Someone who had struggled and who, through hard personal effort and team work, had eventually achieved. Could we hope for a better role model or better message?

**Lesley Wright**

# Make Your Mark in Space

## Nurturing Creativity And Enterprise at the UK Space Conference

Heather MacRae, Venture Thinking, on behalf of the Ideas Foundation

**The Ideas Foundation Mission:** *to identify and nurture creatively gifted young people whose talents may have been overlooked in the exam focused school system.*

- Robin Wight, Chair of the Ideas Foundation and Chair of The Engine Group

The Ideas Foundation is a charity that works across boundaries to foster creativity and enterprise in the arts, enterprise and science. We bring companies and live creative briefs together with schools, colleges and higher education and professional bodies. By crossing these boundaries we are identifying and supporting new creative and scientific talent – primarily in areas of disadvantage.

The “Seeking Saturn” project ([www.michaelcockerham.com/ideas](http://www.michaelcockerham.com/ideas)), funded primarily through the Science and Technology Facilities Council shows how we work. Students from an East London comprehensive faced a range of industry-set challenges, culminating in space summer school and a Dragon’s Den presentation. They worked with Professor Murray and his team at Queen Mary, University of London, along with other supporters from the British Interplanetary Society, EADS Astrium, the Royal Aeronautical Society, and the Parliamentary Space Committee. Winning students took part in a 10 day visit to NASA Centres with ISSET. The project was a pilot one but has identified a number of potential implications for the UK Space conference.

### Inspire

It is important to use space and the UK Space Conference to inspire young people from all backgrounds and all walks of life. Young people not normally interested in science respond well to content that has a strong creative and enterprise element in them. When asked about what stopped them showing an interest in science – one student commented that they didn’t want to be seen as a geek. They were happy though to be seen as a potential photographer or entrepreneur. So people such as Trevor Beattie, Myleen Klass, Richard Branson and others who have interests in space, enterprise and the creative industries are exceptionally powerful sources of inspiration.

It is people and their passion and enthusiasm that gets young people interested and creates that “Aha!” moment when they can see a new interest. The space industry is full of great enthusiasts and communicators – who can really ignite an interest in science. However, activities need to part of a sustained programme so that a student’s interest is supported – especially when there is disinterest and discouragement from their peers.

The astronaut visits organised by the British Interplanetary Society and the International Space School Educational Trust typify the inspirational values – there aren’t many times in my working life in Hackney schools when we had to stop hundreds of children trying to get into a lecture! However, the lecture had most impact when it had a call to action and for further activities. So, helping young people to keep in touch through online communities and blogs could help sustain interest.

Young people like to see people like themselves that they can relate to ... and for many inner city young people there are not many role models from the ethnic communities. Showing students from Birmingham the website of Anousheh Ansari had an exceptionally motivating effect. Charlie Bolden and Al Drew again are terrific motivational speakers – engaging young people in science but also in a positive outlook to life. Dr. Aderin Pocock provided an excellent talk about what a girl from North London can achieve. It might be worth looking at the Arts Council guidelines on audience development to see if the conference programme is maximising its opportunity to attract new enthusiasts – possibly to sampler events.

The UK Space Conference can be an opportunity for young people from all backgrounds to be inspired and to meet other people who share their enthusiasm.

## Inform

There are lots of resources around, but not many easily accessible case studies of the human stories behind the careers. Involving young people in reporting and photographing the event might help to create new more accessible resources.

The proposal to have a new media angle to the event will make the event more accessible podcasts and blog streams could help to reach new audiences if worded in the right way.

## Connect

Funding for outreach activities is difficult to find ... and increasingly it is through partnership efforts that funding is obtained. The UK Space conference provides an opportunity to look at potential funding sources, meet potential partners and share learning on what has worked well and what hasn't worked well.

A "Space Connects" event with a networking element for young people will help young people to meet new contacts, develop personal confidence, and share enthusiasm. However, the Ideas Foundation has found that it helps to prepare young people for networking at conference so they know what to expect and how to get the most out of the event.

## Influence

It is, as Piers Sellers says, this generation which has the opportunity to get involved in future missions to Mars, Jupiter, Europa ... and perhaps to the Moon. It is the young people's engagement in these issues which could be the tipping point for UK attitude towards space strategy. It would be good to have platform speakers from some of the young people who have taken part in Ideas Foundation and ISSET programmes.

So, in summary – The UK Space Conference will have an opportunity to inspire, inform, connect and influence! Charities such as the Ideas Foundation are delighted to support events which inspire new generations of creativity, enterprise and science talent. We hope that the conference will reach new audiences – especially those from inner city and rural communities who would not normally consider going to Charterhouse! We hope that it will provide many moments of inspiration ... and "Aha!" moments when students see how they can make their mark ... and perhaps leave their mark in space.

Working with Enterprise Insight and other partners including SEC, BNSC, BIS we hope to create more opportunities to inform, inspire, connect under an emerging campaign called Make Your Mark in Space.



British-born astronaut Piers Sellers inspires UK students in Houston



# Space Experiment Competition

## A chance for UK students to fly an experiment in space!

The BNSC and Surrey Satellite Technology Limited are offering UK schools the chance to fly an experiment on one of the small satellites built by SSTL.

Any UK students, either individuals or teams, aged between 14 and 18 can propose an experimental package. The winning experiment can weigh up to 1 kg, and will have a development budget of up to £100k.

The experiment could aim to measure some aspect of the space environment, investigate some aspect of the Earth, or test a new satellite technology in Low Earth Orbit

Initial proposals need to be submitted to SSTL by 28 February 2008. Down-selection to the six finalists, who will be invited to submit more detailed proposals, will be announced at the UK Space Conference at Charterhouse in March 2008, and the winners will be announced at the IAF Congress in Glasgow in October 2008.

Initial proposals, (of up to 5 pages), should include:

- The purpose of the experiment the team would like to fly
- What data they would expect to collect
- How they would use the data
- How the experiment would advance space science or technology

The winning experiment will be integrated onto an SSTL mission due to fly in the 2010 timeframe.

Further details of the competition can be found on the competition website at [www.spaceexperiment.info](http://www.spaceexperiment.info) or contact Dr Stuart Eves at [s.eves@sstl.co.uk](mailto:s.eves@sstl.co.uk)

## Competition Chronology

- Competition Announcement – BIS event in Glasgow – November 2007
- Initial 5-page Submission deadline – End February 2008
- Competition Downselect Announcement– UK Space Conference at Charterhouse – March 2008 (6 teams)
- Final detailed submission deadline – End August 2008
- Competition Final – IAF Congress, Glasgow – September 2008
- Completion of experiment build – September 1, 2009
- Presentation on final experiment design – UK Space Conference 2010
- Launch campaign (target) – Early 2010
- Post launch data collection – As defined by experiment
- Results presentation - As defined by experiment, but potentially initial results at UK Space Conference 2011

## Experiment Design Constraints

- Any sensor/experiment should be capable of being externally mounted on the host satellite structure. One or two internal nanosatellite trays (20x12x2 cm) may if necessary be available for electronics to support the sensor. Fields of view are expected to be experiment specific.
- The external sensor/experiment should have a volume no greater than a standard cubesat; i.e. 10x10x10 cm.



- The external sensor/experiment should have a mass no greater than 1 kg.
- The experiment as a whole should consume no more than 1 W orbit average power. Peak power levels will be discussed with the teams post UK Space Conference. Power will be supplied at 28 V from the host satellite.
- The experiment should return no more than 10 Mbits of data per day, via the host satellite's telemetry system. A CAN interface is assumed – SSTL will discuss details of this interface post UK Space Conference. Peak data rates will also be discussed at this stage.
- The sensor/experiment should be designed to withstand the launch loads imposed by a range of LEO launch vehicles. SSTL will provide a vibration specification.
- The experiment should be capable of being constructed in a period of 9-12 months starting from October 2008, such that it is ready for flight in 3rd quarter 2009 (i.e. by September 1, 2009).
- The experiment should be capable of being constructed for a budget of £100K
- It is advised that the experiment should be designed to withstand the typical radiation dose experienced in Low Earth Orbit (1 krad/year). SSTL will advise on component selection to facilitate this, but a radiation testing campaign for the experiment is not envisaged.

## **Amateur Rocketry**

The main focus for this next year for UKRA – the United Kingdom Rocketry Association – is Youth Outreach. We are supporting the UKAYRoC competition and also considering running a workshop for educators (teachers and youth group leaders at UKSC).

The workshop would be informal with tables set up with various activities that the educators could take back to their groups, they would then have the chance to try their hand at the activities with our members on hand to help. The educators would be able to take a booklet away with them with details on all the activities and a copy of our teaching materials.

### **Cath Bashford**

UKRA Council Member

# The United Kingdom Youth Rocketry Challenge

The UK Aerospace Youth Rocketry Challenge (UKAYRoC or “UK Rock”) is based upon the successful US Team America Rocketry Challenge (TARC) the largest model rocket showcase in the USA, which has been running for 5 years, with 670 teams participating, and organised by the Aerospace Industries Association (AIA) and National Association of Rocketry (NAR).

The first ever UKAYRoC was launched in 2006 with the finals being held April 2007. The mission requirement for 2007 was to design, build and launch a rocket that can achieve an altitude of exactly 850 feet with flight duration of exactly 45 seconds from lift-off to touchdown. The rocket also had to carry a raw hen’s egg, which had to survive the flight intact.

The winning team from Buttershaw Business and Enterprise College, Bradford won the UK fly-off held at Charterhouse School and in addition to a cash prize travelled to the USA to attend the Team America Rocketry Challenge (TARC) finals near Washington DC held on 19th May 2007. The Buttershaw students successfully demonstrated their rocket to 100 teams from all over the US, and VIPs who included Defence Secretary Gates and Apollo 11 astronaut Buzz Aldrin, who congratulated them on their success. Also part of the trip was a visit to the National Air and Space Museum and other major sites in D.C.

The UKAYRoC provides secondary school student and youth group teams (3 to 5 members), aged 11-18yrs a realistic experience in designing a flying aerospace vehicle that meets a specified set of mission and performance requirements. Students have to work together in teams, the same way aerospace engineers do. It is not intended to be easy, but it is well within the capabilities of secondary school students with a good background in science and maths, and some craft skills.

The 2008 Challenge is to design and build a safe and stable model rocket flight vehicle, and use it to lift a fragile payload (two raw hen's eggs) to an altitude of exactly 750 feet, for a total flight duration score of exactly 45 seconds, then return this payload safely and undamaged to earth.

The teams will build and test their flight vehicles under the guidance, safety rules and regular launch events established by the UK Rocketry Association (UKRA).

The teams complete qualification flights in front of an independent UKRA member and independent witness, with the top 20 teams being able to qualify for the UK final fly-off event. At the fly-off each team will have a single flight, with the best score winning a final prize for the school and team.

Tripoli’s Ltd, The Royal Aeronautical Society (RAeS), Space Connections and the UK Rocketry Association (UKRA) are the key organisers of the 2008 UKAYRoC each making a valuable contribution to the initiative, namely:

- **Tripoli’s and RAeS** - Overall Co-ordination and marketing of UKAYRoC to industry, government and sponsors; fund raising, coordination of press and media activities; VIP fly-off event organisation and liaison with US Team America Rocketry Challenge; management of UKAYRoC website.
- **Space Connections** - Responsible for all promotion with schools and educational bodies; provide a central help-desk function for schools on all aspects of the challenge; registration of teams and related administration of qualification of teams for the final fly-off.
- **UKRA** - Responsible for all aspects of qualification of teams, safety and insurance related aspect of the challenge; establishment of challenge rules based upon the US challenge; provision of mentors for educational teams; organising and running the final fly-off heats and finals.

# New Media & the Virtual Conference

The Internet has transformed communications. The rapid development of computer networking technology over the past 20 years has led to many radically new methods of sharing information and ideas between individuals, groups and organisations. A UK national space conference has a responsibility to communicate – it should convey the enthusiasm, ideas and aspirations of its delegates to the largest audience possible. To do that, it must harness the “new media” technologies of the Internet.

The power of the Internet to communicate to a large audience of the general public interested in space science and technology was first shown with the NASA ‘webcast’ of the Mars Pathfinder landing on July 4, 1997. The mission website received in excess of 100 million hits in 3 days, and generated such a load on the JPL network infrastructure that NASA was forced to set up a network of 20 “mirrors” around the world, duplicating the website content and spreading the system load [1]. Although relatively new then, such mirroring systems are commonplace now [2].

Traditionally, scientific conferences have communicated to a wider public via two means: conference proceedings and press releases. Proceedings, formal collections of papers and reviews presented at the conference, are (of necessity) highly technical and of limited interest to a wider audience. Press releases are items of interesting news directed at the general public, but have their own limitations. They are typically short, and so can fail to convey the context and significance of a scientific story. A press release may be rewritten or misinterpreted by a journalist with little scientific training, thus leading to mistakes or misrepresentation of the story. Finally, press releases are often dry and formal, and convey little of the human aspect, the excitement of a new discovery. New media technologies can overcome these limitations.

Conferences have used the Internet for advertising (maintaining ‘static’ informational websites) and routine administration (taking delegate registrations) for some years. It is the newer ‘dynamic’ forms of Internet media, typified by regular updates, and two-way interaction between the writer and his/her readership, which offer the greatest potential for reaching out to and inspiring a new and wider audience for space science and technology. Some of these media are discussed below.

## New Media Formats:

- **Blogs:** A blog (contraction of ‘web log’) is a website featuring regular updates of news, thoughts and opinions, typically by a single writer working in his/her spare time. Blogs may collect existing news stories on a particular topic of interest, or contain original material and editorial, or a combination of the two. The important distinction is that blogs do not simply publish, they permit (indeed encourage) interaction with the audience. Blogs typically allow readers to post comments on stories, and start conversations with the blog author or fellow readers, thereby building an online community around a particular subject.

A good example of a space science blog is the Planetary Society’s blog maintained by Dr Emily Lakdawalla at <http://planetary.org/blog/>. Dr Lakdawalla is invited to conferences and reports from them as a journalist. In this way, the Planetary Society’s regular internet audience of 250,000 are kept up to date on the latest news in space science, and the conference organisers gain advertising to a much wider audience than they could achieve on their own.

Once a blog article is published, it gains a unique internet address termed a permalink, and over time a collection of blog articles can build up into an impressive and useful technical reference.

A UK Space Conference should actively consider creating its own blog as part of the conference website, and inviting prominent science & technology bloggers to attend the conference itself.

- **Podcasts:** A podcast is essentially a blog in an audio format. These spoken-word news and opinion pieces, akin to radio shows, can be downloaded and listened to on portable media players and computers. Software allows users to ‘subscribe’ to podcasts, so that new programmes are downloaded automatically by their computer. Podcasts have the advantage that they are useful for listeners in a hurry, and like radio, users can ‘multitask’ while listening. They

are also attractive for those who do not enjoy reading, or simply prefer material in an audio format.

Podcasts have a measurable positive impact on listener attitudes to science. In a survey of 2257 listeners to the weekly 'Astronomy Cast' podcast [3], Gay et al. 2007 [4] found that 70% of the audience gain in interest, actively seeking astronomy content or becoming amateur astronomers.

A good example of a UK astronomy podcast is the Jodcast [5], produced by the University of Manchester's Jodrell Bank Observatory. The Jodcast is a twice-monthly programme on all aspects of astronomy. It includes news and interviews with astronomers, and its reporters have attended both national (NAM 2007) and international (IAU General Assembly Special 2006) conferences [6]. Associations between podcasts and conferences are of mutual benefit: the podcast gains interesting programme items, and the conference event gains effectively free publicity. Astronomy podcasts appear to be growing rapidly in popularity: the Jodcast listening figures double every four months, and more people downloaded the NAM 2007 Jodcast than attended the conference itself.

A UK Space Conference should consider providing its own podcast. This could combine both news items and interviews with contemporary space scientists and engineers, and also digitised archive material (such as that held by the British Rocketry Oral History Project [7]).

- **Web Forums:** A web forum is essentially a conversational web site. A user posts a question or opinion on a particular topic on the website, and other users can post their responses forming an online conversation or 'thread'. Some form of supervision (called moderation) of the system is generally required, to avoid the posting of comments which are deliberately inflammatory or defamatory.

Notable web forums devoted to space include Space Fellowship [8] and NASA Spaceflight [9]. These forums have a broad audience, including both professional scientists and engineers, and individual enthusiasts, meeting together in a friendly and informal atmosphere.

Web forums are useful to conferences in a number of ways: they allow delegates to meet each other online in advance of the event and discuss conference topics, building anticipation or 'buzz' for the event. They also allow the organisers to respond to questions and suggestions from delegates in an open and transparent manner, creating a greater feeling of involvement for the attendees. A web forum would be a useful addition to a UK Space Conference website, but represents a significant investment in time and effort to maintain.

- **Social Networks:** Social networking sites permit individuals to create online profiles for themselves, find and link to their friends' profiles, join groups related to common interests, and post updates on items of personal news. Such networks are hugely popular amongst students and young people: the Facebook network [10] has 43 million users as of October 2007, and is expected to surpass 60 million users by the end of the year [11]. As such, a social networking site represents a powerful means of "word-of-mouth" or viral advertising. A Facebook group for a future UK Space Conference has already been created [12].
- **Virtual Reality:** Computer-generated 3D environments have long been of interest to scientists and educators, but only with the advent of widely-available broadband internet links has it been possible to build large-scale virtual spaces accessible simultaneously by a large audience. The primary use for such systems is currently entertainment, as with the well-known MMORPG (Massively Multiplayer Online Role Playing Game) World of Warcraft.

However, other virtual environment systems are seeing significant educational uses – the de facto standard in this field is Second Life [13], which has over 4 million individual users, and typically ~40,000 virtual characters or "avatars" online at any one time. Gauthier 2007 [14] discusses the use of Second Life in astronomy and space education. The system is being actively developed by JPL and NASA, with their own virtual exhibits Explorer Island [15] and NASA Colab [16]. NASA Ames Center Director Dr Pete Worden gave a conference presentation at ISDC 2007 simultaneously in real life, and by his avatar in Second Life [17].

- Digital Video: Digital video cameras which encode directly into computer-compatible formats, are now cheap and widely available. Conference proceedings can be filmed, and downloadable video placed on the website for later viewing (as was done with some sessions for the UK National Astronomy Meeting 2007). In addition, the session can be placed on video sharing websites such as YouTube [18] or the NSF-sponsored science video website SciVee [19], thereby reaching a much greater potential audience.

Alternatively, video can be 'streamed', or broadcast across the internet in real-time; this is more technically challenging, but gives the immediacy of a live television programme.

A further application of digital video is video-conferencing. Two-way video calling is now routinely available on personal computers via software such as Skype [20], and high-quality conferencing facilities are available at many academic locations via the AccessGrid system [21]. A UK Space Conference should consider using video-conferencing to provide a platform to guest speakers who would otherwise be unwilling or unable to travel to the venue.

## Summary

Blogs, podcasts and dynamic internet media are relatively inexpensive to create. Compared with conventional conference advertising, they can be an efficient and well-targeted method of reaching the intended audience. They have a demonstrated effectiveness in building community around a common interest, and creating enthusiasm for space science and technology. The "virtual conference" associated with a UK Space Conference could be an important online centre for discussion of UK space issues year-round, not simply the few days of the physical event.

The digital media created as part of the conference could go on to form a valuable archive on technological and social change in the early 21st century. The interviews and blogs will form an ongoing resource for teachers – bringing the human element of space development into the science curriculum will provide role models for pupils, and encourage them to consider careers in space-related fields.

With internet media and a few enthusiastic volunteers, a UK Space Conference could be a focus for a much larger entity, the UK space community. It could provide recruitment links for industry, or help link projects with development funding. It could be a forum to present the leading edge of UK space science research and help build collaborations. Educators could exchange lesson plans. Most importantly, it could convey the hopes and dreams of the space community to the next generation. It is for them to continue the journey that we have started.

## J. Duncan Law-Green and David Boyce

About the authors:

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David Boyce is a postgraduate student in the X-ray & Observational Astronomy Group of the Department of Physics at the University of Leicester. He maintains the 'Your Cosmos' blog on space and astronomy news, and has worked as a reporter and interviewer for the Jodcast and on BBC local radio.

References:

- [1] <http://mpfwww.jpl.nasa.gov/MPF/press/cnn/index.html>
- [2] <http://www.alexacom/>
- [3] <http://www.astronomycast.com/>
- [4] Gay, R.L., Bemrose-Fetter, R., Bracey, G., Gain, F. (2007), *Communicating Astronomy with the Public* 1, 24-29.

- [5] <http://www.jodcast.net>
- [6] <http://www.jodcast.net/archive/200704NAM/>
- [7] <http://www.brohp.org.uk/>
- [8] <http://www.spacefellowship.com/>
- [9] <http://www.nasaspaceflight.com/>
- [10] <http://www.facebook.com/>
- [11] New York Times, 25<sup>th</sup> October 2007 (via Wikipedia).
- [12] <http://leicesteruk.facebook.com/group.php?gid=12966340553>
- [13] <http://www.secondlife.com/>
- [14] Gauthier, A. J. (2007), *Communicating Astronomy with the Public* 1, 32-34
- [15] JPL Explorer Island: <http://slurl.com/secondlife/Explorer%20Island/182/155/23/>
- [16] NASA Colab: <http://slurl.com/secondlife.com/NASA%20Colab/245/112/22>
- [17] <http://secondlife.com/events/event.php?id=618506>
- [18] <http://www.youtube.com/>
- [19] <http://www.scivee.tv/>
- [20] <http://www.skype.com/>
- [21] <http://www.accessgrid.org/>



# Students and a UK Space Conference

## Introduction

Inspiring students through space does not simply bode well for the space industry; it bodes well for the country. This is because the term 'space industry' essentially implies scientists and engineers. Space is a uniquely sexy, relatively intuitive and a highly visual branch of science which can act as brilliant hook for students, many of whom will follow something tangential but were originally inspired by space. This can be seen from the increased intake by American universities of science students in the years following the Apollo missions. Therefore, the more students enticed by the possibilities of space, the more scientists and engineers will be produced for the UK.

## The benefits of more UK space students

The British space industry is finding it increasingly difficult to find suitable British students for its science and engineering vacancies. As a result, the British space industry may either decline or become more and more reliant on foreign expertise. A surge in British science and engineering graduates will revitalise the industry and spawn fresh ideas within it.

It has been accepted that there is a chronic shortage of engineers and scientists in the UK in general. Space inspired graduates will help to curb this trend and will aid the regeneration of the UK's industrial capacity and technical expertise. This will result in further economic growth and shift some of the burden away from the service sector. Even if some engineering and science graduates choose not to pursue a technical career, let alone one within the space industry, the UK will still have a more proficient workforce. Large multinationals, especially within the banking sector, almost always prefer engineering and science graduates to those with degrees in less technical and less analytical subjects. Again, this will lead to more economic growth as more efficient companies, a direct result of their employees, generate higher turnovers.

## What is required?

There is an appalling lack of networking opportunities for students wanting to pursue technical careers, let alone ones within the space industry. Careers fairs are dominated by banking and consultancy firms. They swoop down and entice graduates with the promise of money and glory before they can even consider anything else. This needs to be addressed. In addition, more advice needs to be made available to these students whether through publications or through talks given by professionals already within the space industry. In addition, simply getting space enthusiasts, graduates and professionals together, through these talks for example is important to enthusing everyone by the knowledge that a lot of other people are also excited about it. Essentially, graduates need a better idea of what the UK space industry is all about.

There are some outreach programs that already exist within the UK and importantly, outside of the UK. For example, the ESA Student Outreach Program provides a great deal of opportunities for students. However, there are not enough of these outreach programs and the existing ones are not being fully exploited. The UN Space Generation Advisory Council is a great way of getting students together but there are proportionally very few Britons involved. On a national level, Umeå University in Sweden offers summer courses in 'Human Spaceflight and Exploration' for free. Last year, more than half the participants were British. This may indicate that these programs do have potential. Often outreach programs result in students being exposed to impressive space hardware, something which is very inspiring and not often the situation. It is a sad fact that there is a prevailing lack of women interested in working within the space industry. That is an entire fifty percent of the population still left largely untapped. Targeting outreach programs towards women therefore may be a good way forward. Furthermore, a more balanced working environment would tempt even more people rather than the current situation of a massively single gender orientated working environment.

Students will be inspired to follow technical careers and possibly careers within the space industry if more funding was made available to space exploration by the government. A manned spaceflight program would have to be integral to a new funding program. More funding for exciting missions

would also help. Better media coverage of the space industry, thus glamorising it, is also required. This could be achieved by linking space activities, meetings or award ceremonies such as the Arthur C. Clarke awards with high profile personalities. As well as popularizing it, it could be made more glamorous by increasing the average wages for scientists and engineering. In Germany for instance, the engineering profession is on par with those of law and medicine in terms of money and respect.

From a UK National Space Conference Students would want:

- A Careers Fair with an opportunity to meet representatives of employers.
- A chance to hear about the latest developments in the UK Space Industry from leading members of that community.
- An opportunity to meet and listen to young professionals who recently entered the Industry.
- An opportunity to discuss UK Space policy with Policy makers.

**Max Beaumont**

## The Space Education Council

The Space Education Council (SEC) comprises a number of organisations who are involved in using space in education and outreach. Its members come from various sectors, including education, industry and research. The SEC is the operational organisation of the Space Education Trust.

The aims of the SEC are:

- To promote Space (its exploration, research and application) in education.
- To act as a co-ordinating organisation for other organisations involved or interested in the educational values of space.
- To allow its members to exchange information and to combine expertise and experience in the different sectors of space education.

The SEC operates in various ways:

- As a forum for its members to exchange information, coordinate activities, and combine expertise and experience in the different sectors of space education.
- Organising meetings such as conferences.
- Offering educational activities such as space workshops and lectures to its members, to schools, youth organisations, and to the public.
- Running other activities such as:
  - A Space School
  - Space competitions for schools.

The SEC, together with Space Connections, is responsible for the Education Programme at the UK Space Conference. They will also be running an INSET programme aimed at showing how the inspirational power of space can be used to excite pupils to study science, technology, engineering and mathematics – the STEM subjects. Space probably promotes a greater interest in schoolchildren than any other subject, and is one which reaches right across the curriculum.

It is vital to ensure that the UK has the next generation of scientists and engineers who will work on the projects of tomorrow.

**Jerry Stone**  
SEC Chair

[www.secuk.org](http://www.secuk.org)

# UKSEDS Contribution to the UKSC

## What is UKSEDS?

UK Students for the Exploration and Development of Space (UKSEDS) is a national youth based organisation dedicated to expanding the role of human exploration and advancement of space. Our fundamental purpose is four-fold:

- To provide a forum for students, enthusiasts, academics and professionals involved in the international space industry, community and related activities. Thereby promoting the research and development of space related technologies.
- To actively promote the cultural, historic, scientific and technological benefits of space to our members and the general public.
- To cooperate with inter-governmental agencies, professional and academic institutions, industry and other organisations for the advancement and promotion of space in society. Creating an interdisciplinary approach to space and related activities.
- To educate, advise and enthuse students of all ages to engage in science, engineering, maths and technology activities and professions; and so motivating students to excel in space-related fields.

To achieve this purpose UKSEDS maintains a number of affiliated branches at UK Universities. These include: Kingston University (KUSEDS), University of Leicester (LESEDS), University of Manchester (MANSEDS), Kingston College London, Southampton (SOSEDS), University of St Andrews and Durham. UKSEDS also maintains an ever-expanding cohort of full-time members that are spread across the UK and Europe.

## Benefit of UK SC and UKSEDS Collaboration

Together with the organising committee of the UKSC, UKSEDS wishes to collaborate and communicate various space-related events and activities to our members, providing a forum of debate and discussion. Through the dedicated lecturers, seminars and dialogue offered by the UKSC, our members, both young and old, can meet and converse with the key industry professionals, and through the exchange of ideas and concepts learn more about the dynamic space industry.

The UKSC is ideally placed to host a dedicated UKSEDS space careers exhibition, displaying stands with representatives from Industry, Universities and independent groups. This will provide an integral part of the conference, providing a meeting place, social forum and a goldmine of opportunities for those seeking additional information.

Parallel to the main UKSC schedule UKSEDS wishes to implement the Student Planetary Rover Programme, inviting the international SEDS community to present (either by oral presentation or at a poster session) a conceptual design for a lunar rover. This is designed to develop and promote communication, fellowship and camaraderie between all attendees and to facilitate participation in relevant and developing programmes and projects. The 2007 programme was highly successful, soliciting 14 abstracts from University and high school students. There is also the aim to run an Inter-Branch competition (University Challenge based) between the UK, European and international chapters of SEDS. We have already received a lot of support from SEDS USA, SEDS Canada and SEDS India.

These events supported by the UK SC will act as an amazing opportunity in generating international exchange, communication and collaboration, allowing students and young professionals involved in SEDS and beyond to give presentations on their research, experience and careers to date. These activities will assist in fostering the good-will between all international partners – together we can make a significant investment in the future.

## Alison Gibbings

Vice Chair UKSEDS

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## **UK Space Flight and Media Relations – Overview**

The SARTHE group was fortunate to have two written submissions on the role of the media, found below.

John Pitfield's cry from the heart comes from a member of the UK Space Industry - an enthusiast frustrated at what he regards as poor reporting of his Industry.

The response from Richard Hollingham and Sue Nelson indicates the frustration of the professional journalist at John's remarks but also perhaps at a UK Space Community which pays too little attention to the general public and the media.

At SARTHE we were unanimous that the traditional media was vitally important.

From a National Space Conference we need:

- A discussion of the role of the Media in covering Space and how through better networking the community might transmit a more effective and positive message.
- A session examining the 'new media' and how more positive messages may be transmitted direct to the general public.
- A Media training workshops imparting skills to those needing to work with the traditional media.

## **Mass Media and the UK Space Community**

For many years the relationship between the mass media and the UK space community has been one-sided. British efforts are frequently belittled or even ridiculed for humorous effect. Other scientific themes are not treated in such a cavalier manner. Reports about the European CERN project are treated with something approaching reverence and most space activities undertaken by the USA are also reported with respect as are European Ariane launches

One now gets the impression that UK Space endeavours are sometimes covered in the media in the hope of failure. When success is reported it usually is placed in the "and finally" slot as a concession, or merits a few column inches on Page 8. Policy makers are likely to draw the false conclusion that public opinion is not interested in Space.

The media's constant search for sensationalism is warping what is reported and how. A random example of how bad things have got was the recent broadcast of the BBC's "Room 101" where Davina McCall proposed ending all spaceflight. The audience shrieked in approval at her suggestion.

The United Kingdom Space Industry and research community play a significant role in our national life and it is worrying that so few of the general public are aware of their efforts. There is a need for a greater effort to inform and engage the public.

**John Pitfield**

## UK Spaceflight and Media Relations

*A response from science journalists Richard Hollingham and Sue Nelson (Boffin Media) to John Pitfield.*

The summary below represents our personal opinions as science journalists and does not constitute formal professional advice.

We were disappointed with the negative stance of John Pitfield's submission on the UK media and its coverage of space stories. Our professional experience - working as science broadcasters and journalists for the BBC and as freelancers for a number of national newspapers - is the opposite of that reported by John.

Editors we have worked for do not belittle or ridicule space stories - generally they love them! In fact, space science is often far easier to get onto a TV news programme, for example, than other science subjects - not least because the pictures are better. Radio treats space science seriously and so do many newspapers. The tabloids, of course, will sensationalise everything.

It is far better to get a story on air as an 'and finally' than not at all - a genuine prospect for all subjects when competing with so much breaking news. It must also be remembered that if a story doesn't make the BBC 10 O'clock News, for instance, it will be shown repeatedly on News 24 and is posted on the BBC website to reach a wider audience.

Coverage of Mars Express and Huygens - space successes with UK involvement - has been extremely positive. Far from seeing Beagle 2 as a potential failure, the national press supported Beagle 2 right from the early stages of its development - generating publicity that helped Colin Pillinger secure sponsorship and funding for the mission. It is also worth noting that coverage of Beagle 2's loss was broadly sympathetic - if anything it was anti-ESA for failing to support the project properly.

However, it should be accepted that although UK space efforts are undoubtedly valuable there will always be doubters. We should therefore engage in the arguments. Most space efforts are supported directly, or indirectly, by the taxpayer and the space community needs to be accountable.

Neither is space just space science. The debate over the Galileo satellite navigation system is an important one involving, potentially, considerable sums of public money. The UK space community needs to engage in this debate, in doing so the profile of the project will be raised. The arguments in favour of Galileo were recently put forward by Matthew Parris in the Times - an unlikely place to find a 'space' story.

As science journalists who media train scientists for Boffin Media (yes, the title is ironic) we actively encourage communication with the media. Without a story a journalist has no work. Direct engagement with the wider community, through blogs or podcasts is important (we recently produced broadcast-standard podcasts for BNSC) but in order to reach a wider audience it is essential to engage with journalists.

Any approach to the media needs to be positive and proactive. Attitudes that 'the media's constant search for sensationalism is warping what is reported', do little to foster relationships. The UK media is one of the most diverse and competitive in the world and covers everything from tabloid newspapers to scientific journals.

Science journalists need new results or interesting findings. News journalists need significant events, economic or political science stories. But this is a two way process and it is also up to the space community to build contacts and provide stories (and suitable interviewees). A negative approach to the media is counterproductive.

Finally, the example of Davina McCall throwing spaceflight into Room 101 in the SARTHE report is disingenuous. Room 101 is a comedy programme. Previous suggestions have included Doctor Who, airports, football and novelty underpants. The comparison with Doctor Who is best, perhaps. To many people it's an essential part of their life and an example of creative and technical collaboration at its best. To others, it's Doctor Who!

You'll never please all of the people all of the time but be positive, talk to science journalists – talk to us! – and you'll be convinced that space science is something we take extremely seriously.

### **Recommendations:**

While we disagree with the negative tone of John Pitfield's remarks in the SARTHE report, we broadly agree with his recommendations. In addition we would suggest the following.

- The space community needs to be more proactive in pushing genuine stories of interest to news and feature outlets.
- Journalists are always after UK angles for stories. Providing them (quickly) with suitable interviewees is essential. At the moment non-specialist journalists will struggle to find suitable people. An online database of 'space people' could be set up or use made of existing journalist-friendly databases. However, all the people need to be media-aware and media-friendly.
- Media training – The space community needs to build up a group of media-friendly people to communicate effectively on TV and radio. Young people, experts or people the audience can connect should receive media training.
- Podcasting – A professionally produced UK space podcast, if properly promoted, could significantly raise the profile of UK space activities. The costs are relatively small but, given the amount of material on the web, it would need to be marketed well. Boffin Media recently produced podcasts for BNSC which have received much positive feedback.

### **Richard Hollingam and Sue Nelson**

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# **A UK National Space Meeting - The MSSL Position**

MSSL enthusiastically supports the idea of a national space meeting which comprises both technical and outreach aspects. On the technical side, we believe that the UK space community would benefit hugely from an annual focus where the scientists and engineers working on space projects can get together, present their results, and generate new ideas and collaborations. To be successful, such a meeting would need to attract a wide range of people from within both industry and academia, from students up to senior management. It would provide a natural opportunity to attract media and government attention for new results and the continuing achievements of UK space research; currently, the RAS National Astronomy Meeting is the only UK conference providing this kind of press focus. It could also support other initiatives such as a careers fair.

We believe that a large technical meeting of this sort, as well as being enormously useful to the professional space community, would provide the most secure basis for a high-profile annual space outreach event. There are a number of reasons for this. Firstly, it is easier to secure funding for the technical side of the meeting, and thus place the event on a secure financial footing. Secondly, it would bring together companies and universities who, between them, have immense experience in providing high-quality outreach materials and activities, and would ensure that these activities were based on real cutting-edge research. Thirdly, if the event does not attract UK groups (many of whom cannot justify funding significant participation in an outreach-only event), it will inevitably become yet another advertisement for foreign space agencies which already have massive PR budgets, and lose its UK focus.

For a truly national focus for the outreach side of things, there need to be activities that go beyond local schools. The UKAYROC rocket competition at BROHP 2007 worked very well; another possibility is a space-related competitive science fair with a suitably desirable prize. A science fair is particularly well suited to the nature of UK space research, which is currently concentrated on the kinds of activities that are easily translatable to exciting school-level projects: robotics, telecommunications, geology, astrophysics, biomedicine, electronics, space structures and so on. This opens up all kinds of possibilities for collaborations between schools, industrial and university groups, and from the university perspective fits in well with the Widening Participation and Gifted and Talented agendas.

Organisationally, we feel that any national space meeting with a technical component should be led by a body that is representative of the professional UK space community as a whole, either at the level of research councils, civil service, or learned/professional societies. If this is not possible, any consortium organising the meeting should have a major representation from UK institutes and companies actually involved in doing space research. If that is not the case, there is the risk that the meeting would lose its grounding in the reality of what the UK space community actually does - and what it could do in the future.

## **Points for discussion**

- How important is the location of the conference in encouraging attendance? Should it stay at Charterhouse or move to, for example, another boarding school, a university campus or a purpose-built conference centre?
- Should a national space conference be hosted in a different place each year? Would this be a way of accessing regionally-based funding mechanisms?
- Could there be the prospect of BROHP (which is more education-focused) joining up with the existing BIS UK Space Activities meeting (which is becoming more technically-focused) and pooling their resources?

**Alex Blustin and Lucie Green**

Mullard Space Science Laboratory

## “Space Policy”

*Space Policy* publishes commissioned and unsolicited (but peer reviewed) material from a wide range of authors and institutions, both sectorally and geographically, on the political, economic, legal, industrial and cultural background to all space activities. The aim is to cover space developments wherever they take place on the globe.

Unsurprisingly, the greatest number of contributions comes from the USA, where readership is also highest. But, while the second highest readership is in the UK, papers on UK space policy are scarce indeed. The recent attempts to forge a European space policy and to incorporate this into the moribund EU treaty have prompted numerous opinion pieces on the right way forward, as have issues such as GMES and Galileo. French and German authors, in particular (but also Dutch and Italian) are keen to air their views and put forward proposals, despite possible language difficulties. The same goes, increasingly, for authors from Asia, where ambitious plans for space are becoming evident.

But, while British, mainly academic, authors are regular contributors on subjects such as space law, remote sensing data access, planetary protection or the history of the Space Age, there seems to be a marked reluctance to engage with the process of UK space policy. And it's not for want of trying on my part!

*Space Policy* is therefore hosting a panel at UKSC at which participants will be invited to debate the content, form and future of UK space policy.

The aim is to publish a report of the debate and perhaps some individual contributions in the August 2008 issue of the journal.

## UK Space History

"History is about the present and the future as well as the Past"

History unites the UK Space community and it informs our view of the present but also our aspirations. Decisions taken half a century ago still impinge heavily on British Space policy. A study of that past can show us the way forward after all the study of history can only change the future not the past.. Whatever we think of the decisions taken by past British Government policy, we must understand them when we debate future policy.

But in addition to this, the work done by British scientists and engineers has been innovative and, given the constraints under which they were working, quite remarkable. We owe it to those men and women who worked so hard to remember and record their achievements. Some of their legacy may have disappeared but some has been carried through to the present day. From Jodrell Bank to Cassini-Huygens it is a fascinating history full of challenges, personalities and drama. Recorded and retold it can inspire young people to take on new challenges and gives us a foundation on which to build further.

In this context, the Charterhouse conference produces an annual journal, *Prospero*. The journal is intended to be a record not only of papers given at the conference, but also an historical record of the work done in the past. One of our aims is to record the experiences of these pioneers. Official histories can tell us only so much about how the work was done; those involved can not only relate their achievements, but what it was like working on such advanced projects even fifty years ago.

**Nick Hill**



## The Conference Venue

It was argued that a UK Space conference should be peripatetic, moving around the country from year to year. However, it was also argued and accepted at SARTHE that in 2008 that the conference should take place at Charterhouse School. The venue for subsequent years is subject to discussion.

Charterhouse is an exceptional venue where an excellent relationship has grown between the commercial lettings department and their staff, the organisers of the BROHP conference and those attending the conference. Undertaking the running of such a large and complex conference is challenging but the risks can be mitigated by building on the relationships and tacit knowledge built up during nine BROHP conferences.

The school has excellent access; it is just three miles from the A3 and approximately 15 miles from the M25. There is also an excellent train services 40 minutes from London. Situated 3 miles from the town of Guildford Charterhouse is set in 240 acres in the heart of the Surrey countryside. The extensive grounds provide a beautiful backdrop which adds to the enjoyment of those attending the conference. The extensive grounds and on site accommodation will enable the UKAYROC to have teams of children and staff from twenty schools competing.

The school has a particular connection with the UK aerospace industry. The John Derry Technology Centre (1980), is named after the post-war test pilot, an Old Carthusian and the first Briton to fly faster than sound. There are well equipped classrooms which provide ample space for parallels and the Main Hall provides exhibition space.

Visitors from NASA have been particularly delighted by the history and ambience of the school. This is not the conventional conference centre but something rather memorable. The original school was founded by Thomas Sutton in 1611 on the site of the Carthusian monastery near Smithfield. Revd Dr William Haig Brown was responsible for moving the School to the current site in 1872. The Chapel built in 1927, is the largest war memorial in England. It was designed by Sir Giles Gilbert Scott, architect of Liverpool Cathedral and designer of the red telephone kiosk. Before the Sir Arthur Clarke Awards, champagne is served on the lawn in front of the chapel.

Charterhouse has also been involved in bringing youth together on an international scale; Lord Baden-Powell was an ex-pupil who established the world-wide scouting movement.

The school also has links with exploration. George Mallory, a master between 1910 and 1921, disappeared near the summit of Everest in 1924, whilst Wilfrid Noyce was both a pupil and a master at the school, and was one of the successful Everest team of 1953.



# The Sir Arthur Clarke Awards

## Hollywood has the Oscars® - We have the Arthurs!

Each year, there are various awards for the best in film, TV, the theatre and music, but there is also an award designed to recognise and reward the best in space research and exploration. Since 2005 the Sir Arthur Clarke awards have been presented at the gala dinner which closes the annual space conference held at Charterhouse.

A major difference between the Arthurs and the Hollywood awards is that in the film industry it is the actors who nominate the actors, the directors who nominate the directors, and so on. With the Arthurs, the nominations come from the public. Our call is;

“Have you been impressed, intrigued or inspired by some aspect of space research?”

People are invited to go to the website at [www.clarkeawards.org](http://www.clarkeawards.org) and use the on-line form to submit their choices. Nominations open after the awards dinner, and close at midnight on 31 December.

The awards have a number of categories, though they are not necessarily all awarded each year; this depends on the quality of the nominations submitted.

### The awards for 2007 were:

#### Best Corporate / Team Achievement

- The Mars Exploration Rovers team

#### Best Individual Achievement

- Steve Squyres

#### Best Presentation: TV / Radio

- “The Sky At Night” production team

#### Best Presentation: Written

- Charles Cockell, for “Space on Earth”

#### Best Space Reporting

- Robin Scagell

#### Achievement in Education

- The International Space School Educational Trust

#### Outreach Award for the Public Promotion of Space

- Lord Sainsbury

#### Inspiration Award

- Sir Patrick Moore



Other categories are **Best Student Achievement** and **Best Film Presentation**, and there is now an award for the year's **Space Entrepreneur**.

Previous award winners have included Colin Pillinger, Michael Foale, Patrick Moore, Reginald Turnill, John Zarnecki and the National Space Centre.

In addition to these categories, there is a **Special Award** whose recipient is chosen by Sir Arthur himself, independently of the judging panel. The 2007 winner was the science fiction author Ray Bradbury.

There is also a **Lifetime Achievement** award. Previous winners have been aerospace reporter Reginald Turnill and test pilot Eric Brown.

“Oscar” is a registered trademark of the US Academy of Motion Picture Arts and Sciences.

The awards Director is Jerry Stone, a freelance presenter on astronomy and space exploration who has promoted space for nearly 40 years. He says;

“The UK is a world leader in many aspects of space research, and many of the nominees should be regarded as heroes in their field. Their names may not all be widely known by the public, but they richly deserve an honour such as this. The UK should be very proud of its achievements in space research and exploration, which we hope will provide jobs, research and inspiration for the next generation.”

### The Genesis of the Arthurs

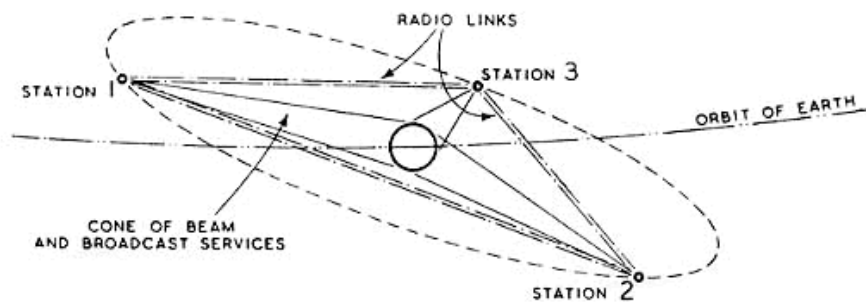


In 2005 there was an additional aspect to the proceedings at the Charterhouse conference, with the introduction of special awards, which are regarded as the space equivalent of Hollywood’s Oscars. The awards are intended to provide recognition and tribute to those who have worked for the advancement of space exploration. Although there may be some international involvement, the aim is to concentrate on British achievement. It was obvious that the awards should be named after Sir Arthur Clarke, who is known around the world for his far-sighted writings on space exploration, and it was a delight to receive Sir Arthur’s agreement to his name being used in this way.

Sir Arthur’s most famous work of non-fiction was produced just over 60 years ago, with an article in the October 1945 issue of *Wireless World* entitled “Extraterrestrial Relays”.

In this paper, he calculated that a satellite at an altitude of 22,300 miles would take 24 hours to circle the Earth. As the Earth itself rotates in this time, such a satellite placed in orbit over the equator would appear to stay in the same point in the sky - it would be a geostationary satellite.

He showed that three such satellites, spaced 120° apart, would be able to provide worldwide communications coverage without the need to be tracked across the sky. This was around 20 years before the first such satellite was



launched; today there are hundreds, each occupying what is now called the Clarke Orbit.

His most famous work of fiction is “2001: a space odyssey”, which deals with the discovery of the first evidence of extra-terrestrial intelligence, in the form of a monolith buried on the Moon which had previously helped the evolution of intelligence in early ape-men in Africa.

The award takes the form of a solid glass block in the proportions of the 2001 monolith. Etched on the front is the diagram of three satellites in orbit which was included in the original 1945 article on satellite communications.

Sir Arthur, who has just turned 90, resides in Sri Lanka. His diving school was swept away in the 2004 tsunami which devastated areas of the island. The awards dinner also acts as a fund-raising event for Sarvodaya, the largest development charity in Sri Lanka, which has been reaching out and helping the poorest of the poor for over 45 years.

## The Judging Panel

The judges comprise an invited panel from the UK space community. Once the nominations close they draw up a shortlist of categories and nominees. Some members are winners of previous year's awards.

The 2007 judges were:

Jerry Stone	Director of the Sir Arthur Clarke Awards Chairman of the Space Education Council
Lesley Wright	Co-organiser of the BROHP conference. Chair of the judging panel
Claire Etherington	Chair of UK Students for the Exploration & Development of Space
John Harlow	President of the British Interplanetary Society
John Holt	The Arthur C Clarke Foundation.
Gareth James	Previously of the National Space Centre
Andy Lound	UK Co-ordinator for the Planetary Society
Bo Maxwell	Managing Director of the Mars Society UK
Pat Norris	Chairman of the Royal Aeronautical Society Space Group
Colin Pillinger	Professor of Planetary Sciences at PSSRI
Chris Riley	Science writer, broadcaster and film-maker
George Scoon	European Space Agency (Retired)
Alistair Scott	Communications and Public Relations; EADS Astrium
Martin Shelley	Space Education Consultant
Michael Simpson	President of the International Space University
David Southwood	Director of Space Science for the European Space Agency
Nick Veck	Chairman of UK Space
David Williams	Director General of the British National Space Centre
John Zarnecki	Director; Centre for Earth, Planetary, Space and Astronomical Research

## Some of the award winners



The 2005 Special Award was presented to the British Interplanetary Society.

Here it is held by Suzann Parry (Executive Secretary) and the late Dave Fearn (Vice President).



Professor Colin Pillinger, winner of the 2005 Outreach Award for the Public Promotion of Space.



British-born astronaut Michael Foale, winner of the 2006 Inspiration Award



John Zarnecki won the 2005 award for Best Individual Achievement for his work on the Huygens probe which successfully landed on Saturn's moon, Titan.



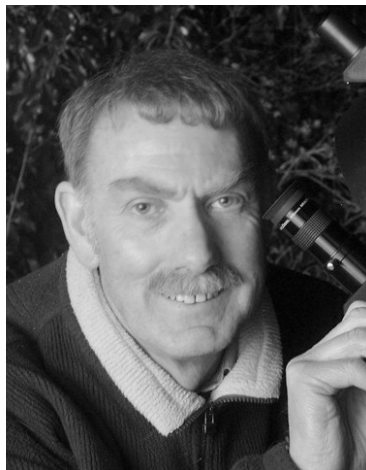
Sir Patrick Moore

Winner of the 2007 Inspiration Award



Lord Sainsbury

2007 Outreach Award



Robin Scagell

Best Space Reporting 2007



Ray Bradbury

Special Award 2007

## The Future of the Awards

The awards have depended almost entirely since their inception on the efforts of Jerry Stone. We are particularly grateful to EADS Astrium who sponsored the very first awards and have been our main sponsor ever since. We are also grateful to PPARC / STFC who came on board in 2006 and SSTL in 2007. Thanks also go to LogicaCMG and BNSC.

The awards event is a black-tie dinner held in the main hall at Charterhouse. Tickets are offered to individuals at £50 each, and tables and display space are offered in a range of sponsorship packages:

- |          |  |        |
|----------|--|--------|
| • Gold   | Exhibition space and an 8-place table at the Awards:<br>£500 of this goes to the charity Sarvodaya | £1,500 |
| • Silver | A half-table (4-places) at the Awards:<br>£250 of this goes to the charity Sarvodaya               | £750   |
| • Bronze | Exhibition space only (e.g. panel display):  | £250   |

Other sponsorship opportunities include

- the Student Opportunities Event (Careers Fair)
- to cover meals or refreshments
- advertising in the conference book
- to sponsor a conference session

In addition, all the short listed nominees are invited to attend as our guests so that they too can be recognised. The event begins with a champagne reception held on the lawn in front of the chapel. The award ceremony is followed by musical entertainment until the close of the evening and overnight accommodation is available on site. Those who are staying overnight can retire to the accommodation blocks, where celebrations usually continue until the small hours.

The event has now been established as an important focus in the UK Space calendar. However, now it is established there are eager calls for the event to be better publicised and for a higher media profile. This requires better co-ordination across the UK Space Community and a significant increase in sponsorship to increase the profile of the event. A move to a prestigious London venue with more celebrities and greater media involvement has been widely discussed and may be possible in future years.

## Jerry Stone

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 Website        www.geocities.com/spaceflight\_uk

The Sir Arthur Clarke Awards Website                  [www.clarkeawards.org](http://www.clarkeawards.org)

Our thanks to Jerry for his tireless unpaid contribution to the event.

# Acknowledgements

We are very grateful to all those who took part in the symposium, and to everyone who has contributed to this report.

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