

→ NEWS FROM HARWELL

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ESA Director General speaking at the 7th Appleton Space Conference

The creation of a new ESA Centre commenced in 2009 within one of the United Kingdom's most prestigious science and technology research campuses near Harwell, 24 kilometres south of Oxford.

The HARWELL OXFORD Campus is host to major scientific facilities, including the Diamond Light Facility, the STFC Rutherford Appleton Laboratory, the UK Medical Research Council and the UK Health Protection Agency.

The ESA Harwell Newsletter is designed to provide information about programmes, activities and people at the Centre and in the UK space sector generally. This issue covers the period for **August-December 2011**. The next issue will be published in April 2012.

The team at ESA Harwell welcomes your feedback to make this report as informative as possible. **MERRY CHRISTMAS & HAPPY NEW YEAR 2012!**

Please send your comments and suggestions to: harwellcentre@esa.int

Earth Observation / ESA Climate Office

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The main focus for the ECO was the annual Climate Change Initiative (CCI) collocation meeting via which the CCI programme is coordinated. The CCI focuses on Essential Climate Variables (ECV). CCI activities currently extend to Data Products, Data Harmonisation and Systems Engineering, and are coordinated with the Committee on Earth Observation Satellites (CEOS) and the International Geosphere-Biosphere Programme (IGBP). The ECO continues activities on 4D Scientific Data Visualisation and Data Assimilation. Potential ECO roles were studied by a joint ESA-UK Space Agency team under the Harwell Working Group having briefed the ESA Director General in November.

Exploration

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The Exploration team at ESA Harwell continues to work both with ESA staff and UK Space Agency representatives to obtain a better definition and a clear plan for the future of Exploration activities in the areas of space nuclear power, planetary protection and autonomous systems at the Harwell Centre. The Beagle engineering samples are now transferred to the care of the ESA Harwell Centre. A joint ESA-UK Space Agency team prepared a detailed definition of possible future activities at the Centre for the November briefing of the ESA Director General.

Innovation & Technology Transfer

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The ESA Harwell Centre continues to support a wide-range of activities relating to innovation and technology transfer. The team focused on acquiring information on UK industry-academic networks and management practices notably via a visit to the EADS Innovation Works (Newport, Wales) and participation in a UK Advanced Institute of Management (AIM) Research workshop on *Managing Industry-University Links*. A notable event has been the initiation of the STARTIGER/Seeker project – an ESA-funded project undertaken by a RAL Space-led consortium – which focuses on innovative, mobile autonomous operations for planetary surface systems.

Integrated Applications Promotion Programme

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The Integrated Application Promotion (IAP) Programme at ESA Harwell continues its active outreach activities via the Ambassador Platform, reaching out into UK industry and commerce to identify opportunities for IAP programme intervention. The Applications Business Office (ABO) is now established and continues the development of the IAP business case. It is working with the Ambassador Platform in conjunction with UK Technology Strategy Board (TSB) and industry to identify the future case for applications and innovation activities at ESA Harwell. The joint team prepared a detailed definition of possible future activities at the Centre for the November briefing of the ESA Director General.

UK Space Activities

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This report provides information on a wide-range of UK space sector activities covering UK government funding, UK Space Agency developments, the developing UK national space technology strategies, and other important events in the United Kingdom space sector. It is noted that significant progress is being made in the implementation of the UK Innovation & Growth Strategy (IGS) via new funding for national programmes.

ESA Centre Development

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The UK Space Agency has presented its vision for the future of the Harwell Centre to the ESA Director General in November. This vision is supported by the UK Minister responsible for Space. When building its programme proposals for the post-2012 period, ESA will define a UK role that matches the stated UK ambition to host a significant ESA establishment. The joint ESA-UK Space Agency teams will continue playing a key role in defining the future role of the Centre in the context of the Harwell Working Group.

The ESA Harwell Centre remains stable with 14 staff on-site. Infrastructure and support requirements are complete and future accommodation is agreed to enable planned short-term expansion.



Climate Change Initiative

The ESA Climate Change Initiative (CCI) is a programme of work developed in response to requirements of the international climate community to generate a set of validated, error-characterised, Essential Climate Variables (ECV). The ESA Climate Office is now responsible for five ECV projects: namely *Fire Disturbance*, *Glaciers & Ice Caps*, *Cloud*, *Sea-Ice*, and *Soil Moisture*.

The main focus of the ESA Climate Office in the months leading up to October was preparing for the annual *CCI Collocation Meeting* in ESRIN. This 3-day event was a chance for the projects, which are spread around Europe, to meet and discuss their progress, difficulties they've encountered and to plan for phase 2 of the CCI programme. Phase 2 discussions centred on the system engineering requirements needed for coherent generation of ECVs in the future. At this stage, the focus was on what types of operational production system would be most effective, and the prerequisites each option would entail.

Several splinter groups were also held to discuss cross-cutting issues relating to the CCI programme (see CCI Working Groups below).

The Science Leaders from all 14 projects looked at ways to work more closely together, by writing a joint paper on the CCI programme and preparing a scientific brochure in support of the ESA Ministerial Conference 2012. A collocation report, including the outcomes from all working groups, is being prepared and will be available online soon.

Harwell ECV Projects

The *Cloud* project annual review was held successfully on 7 October at Deutscher Wetter Dienst (DWD), Germany. Good progress has been made, including a complete review of the system engineering aspects, which will be very useful for the rest of the CCI programme. Preliminary discussions on error characterisation have also been fruitful. A progress meeting involving the whole consortium was held in Harwell at the end of November.

The *Fire Disturbance* project has passed its 1st Annual Review successfully in October. The consortium organised a joint meeting with the Global Observations of Forest Cover-Global Observations of Land Dynamics (GOF-C-GOLD) Fire Implementation Team to discuss algorithm inter-comparison exercises with over 50 participants worldwide.

The *Glaciers & Ice Caps* project held its first Progress Meeting in November and presented significant progress. Both the Glaciers and Fire teams were strongly represented at the CCI Collocation Meeting.

The *Sea-Ice* and *Soil Moisture* projects start-up activities are imminent. Their Science Leaders were present at the recent CCI Collocation Meeting.

CCI Working Groups

A *System Engineering Working Group*, including representatives from most ECV projects, has been established to discuss the status of each ECV project and common issues such as the volume of data to be handled, system requirements and user access.

The CCI Collocation Meeting provided an opportunity for a face-to-face workshop to discuss the processing of data from the algorithm inter-comparison exercise and system architecture options. A further meeting of this group took place during December, following on from the outcome of the collocation meeting and included the three newest projects to join the CCI.

Discussions in the *Data Harmonisation Working Group* resulted in a number of recommendations for data standards and data dissemination protocols. A set of guidelines for CCI data producers has been released and feedback from the projects has been gathered. These guidelines apply to data produced during Phase 1 of the CCI in order to achieve consistency between projects.

Data Visualisation & Assimilation

A call for tender on "Interactive Visual Analysis of 4D Fields, Processes & Dynamics" led to two very good proposals that have been both implemented. The first project is led by *Magellium UK* supported by a consortium based in the new International Space Innovation Centre (ISIC) at Harwell. It is a good illustration of the synergy created by having ESA and ISIC in close proximity. The second consortium, established around *Uninova* of Portugal, proposes a complementary approach to the Magellium proposal. The ECO is implementing these two contracts to obtain maximum benefit from both activities by putting the emphasis on the synergies and complementary aspects of the two projects.

Three collaborative Data Assimilation projects with the UK National Centre for Earth Observation (NCEO) are being finalised and activities will commence in early 2012.

GlobICE Project



Good progress has been made with the GlobICE project during its latest period. Product generation has now finished with the completion of the Arctic

2010/2011 season processing. An announcement of this new data set was issued at the end of November. The Antarctic prototype work has been completed with the successful adaptation of the processing chain to create southern polar GlobICE products.

For the prototype period, Advanced Synthetic Aperture Radar (ASAR) coverage was shown to be very good, and demonstrated that the GlobICE processor can produce useful sea ice dynamics data over a significant proportion of the southern polar region. Two months of sample southern polar products (September/October 2009) were generated, and these were released to the user community in December 2011.

The 2nd GlobICE User Workshop was incorporated into the Sea Ice sessions at the American Geophysical Union (AGU) in San Francisco (5-9 December 2011). The project is expected to be completed by end January 2012 with all but one major deliverable

completed by end December 2011, and a final project presentation arranged for February/March 2012.

There is a new website – www.globice.info – which will be fully available at the end of December; the previous website – www.globice.mssl.ucl.ac.uk – will be maintained for the time-being.

Committee on Earth Observation Satellites (CEOS)

Established in 1984, the Committee on Earth Observation Satellites (CEOS) coordinates civil space-borne observations of the Earth.

Stephen Plummer (of the ECO) helped lead the production of the first draft of a protocol for the measurement of Leaf Area Index to be used for



validating satellite estimates of this variable. The draft protocol responds to one of the actions defined in the Global Climate Observing System

(GCOS) Implementation Plan. It is currently under review by scientific experts and will be placed in open review in January 2012.

Stephen Plummer was also invited onto the executive committee of the CEOS Carbon Task Force as a European representative alongside the co-chairs from NASA and JAXA. He will work with his peers to ensure the CEOS response to the Group on Earth Observations (GEO) Carbon Strategy is produced rapidly. In this context he was invited to present progress to the wider carbon cycle research community at a conference on "Carbon in a Changing World" in Rome during October. He also attended the Carbon Task Force Side Event at the 25th CEOS Plenary, Lucca, Italy.

International Geosphere-Biosphere Programme (IGBP)

IGBP was launched in 1987 to coordinate international research on global-scale and regional-scale interactions between Earth's biological, chemical and physical processes and their interactions with human systems.

The ECO organised the IGBP Observation Strategy Meeting at Merton College, Oxford in September.

The meeting brought together key scientists from all aspects of the IGBP community, as well as other important groups (including GEO, DIVERSITAS and CEOS) from all over the globe. Discussions centred on aspects of the observing strategy needed to address the interfaces between different observation types (*in situ*, satellite) and domains, including ocean, atmosphere, land and especially the role of humans as actors. This has resulted in the production of a draft document – the *Merton Initiative* – which will be presented at the “Planet Under Pressure” Conference, London, March 2012. The ECO, through the IGBP Liaison Officer, Cat Downy, is now making preparations for this conference as a forum to explain the contribution that ESA makes, in particular through the Climate Change Initiative, to understanding the Earth system.

Earth Observation Networking

The ECO has been present at a number of meetings relating to the UK Climate & Environmental Monitoring from Space (CEMS) facility as well as the NCEO & CEOI Joint Science Conference (5-8 September).

The ECO supported the *QA4EO Workshop* (18-20 October), organised by RAL Space. It involved many scientists from around the world and succeeded in reaching communities outside the space arena. In particular, the European Environment Agency (EEA) represented by its director, was very active during the workshop.

The ECO also participated in the *e-Research South - Space Workshop* (9 November) and presented the CCI objectives for system engineering to a large group, representing both academia and industry. More about this programme can be found at:

<http://www.eresearchsouth.ac.uk/>



Exploration at the ESA Harwell Centre is focusing on robotics, space nuclear power, autonomy & artificial intelligence, and planetary protection.

The activities on Exploration & Related Technologies at Harwell continue to focus on the planning and assessment of the future contribution the ESA Harwell Centre can bring to these domains in the wider ESA context.

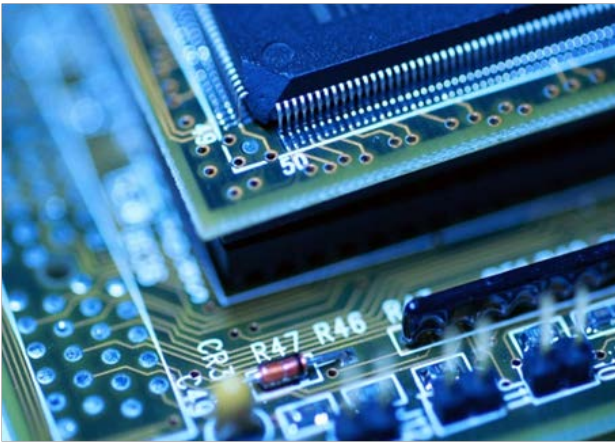
STARTIGER – Space Technology Advancements by Resourceful, Targeted & Innovative Groups of Experts & Researchers – projects aim at accelerating standard R&D processes to achieve technology breakthroughs. At Harwell, the *STARTIGER/Seeker* project, led by RAL Space, started with a 3-day workshop at the end of September. The project is relevant to the ESA exploration programmes because it is expected to demonstrate UK strengths in the area of autonomous navigation on distant planetary surfaces amongst others, e.g. advanced optical sensors and image processing, advanced algorithms for autonomous systems. It could become relevant within the context of a planetary surface technology focus for Harwell. See section “Innovation & Technology Transfer” for more technical details.

The scope of a feasibility study for a *Robotics & Autonomous Systems Test Facility*, covering all aspects of “landed” robotic exploration missions for both the roving platform itself and for the fully-integrated platform plus payloads, has been agreed. It is currently in the bidding phase with an expected kick-off by January 2012. The study will aim at the identification of areas for future UK investment in facilities to complement and enhance the European capabilities for test and simulation of such systems.

The first step towards an engineering sample repository with an associated knowledge database has been completed through the acquisition and cataloguing of the Beagle 2 Gas Analysis Package (GAP) experiment samples and documentation at ESA Harwell. Building on the experience gained in the acquisition process, a coherent set of requirements for the ESA central repository for engineering samples will be elaborated during the course of 2012. The UK considers this as the initial step towards a bio-containment facility for sample return missions.

Currently, a series of activities in the Mars Robotic Exploration Preparation (MREP) context related to space nuclear power systems safety aspects, the encapsulation architecture and the thermoelectric, as well as Stirling-cycle converter, technologies are being run from ESTEC. A first breadboard for the thermoelectric conversion technology has been delivered recently to ESTEC by a consortium led by University of Leicester. In 2010, a forum comprising the UK Space Agency, industry and academia met to discuss the UK involvement in the ESA programme for space nuclear power systems. Now, in 2011 the forum met again and confirmed the UK commitment to play a significant role in the development and delivery of nuclear power systems for space use. In this context, the UK will aim to achieve maximum benefit from existing civil nuclear facilities as well as ensuring spin-out applications of related technologies.

The Exploration & Related Technologies team at Harwell continues to scout and survey UK high technology sectors for promising technologies with potential benefit to space exploration. These technologies are assessed and, where found appropriate, proposed for future use within ESA exploration activities.



The ESA Harwell Centre is established on the Harwell-Oxford campus that focuses on leveraging the combination of existing large facilities and related expert knowledge to drive technological innovation. The campus also hosts the International Space Innovation Centre that has close links with the UK Technology Strategy Board.

National Space Technology Roadmapping Update

15-December 2011: the ESA Harwell team supported the UK National Space Technology Strategy Roadmaps Refresh Workshop. Its object was to review, refresh and update the UK space technology roadmaps that were published earlier this year in coordination with the UK National Space Technology Strategy document. The workshop was attended by a broad range of participants from the government, industry and academic sectors to ensure that the roadmaps remain representative of the combined vision for UK space technology development.

A critical element of the workshop was the definition of the terms of reference for the new National Technical Committees. These organisations, meeting regularly, will assimilate the information from the roadmaps, assess and analyse them and identify the UK technology priorities over the medium to long-term. The results will be used to inform UK government funding decisions with regard to future space technology programme commitments at national and European levels, supporting the coordination between UK and ESA.

<https://connect.innovateuk.org/web/national-space-technology-strategy>

Industry – University Innovation & Collaboration

As part of its remit to study new ways of doing business in the ESA context the Harwell team visited the EADS Innovation Works (EADS-IW) at Newport (Wales) to learn about the methods and strategies used by EADS in developing and sustaining Industry-University links.

EADS Innovation Works is the global network of EADS corporate research facilities, with sites in Germany, France, UK, Spain, Singapore, Russia and India. The geographical and functional structure is consistent with the EADS research & technology strategy and covers the skills and technology fields that are of critical importance to EADS.

The role of EADS Innovation Works is to foster technological innovation through the sharing of capabilities and knowledge amongst the elements of EADS. The organisation is responsible for developing and maintaining technology partnerships with universities and research centres world-wide.

Teams within EADS Innovation Works are organised in seven trans-national Technical Capability Centres covering the areas of: composites technologies; metallic technologies and surface engineering; structures engineering; production and aeromechanics; engineering, physics, information technology, security services and simulation; sensors, electronics and systems integration; energy and propulsion; and innovative concepts and scenarios.

In UK EADS-IW has a core centre at Filton with two attached hubs at Newport and Guildford. Attached to the hubs are eleven UK university research groups which conduct research relevant to the EADS corporate mission. One of the most recently opened collaboration links is that with the University of Surrey which will, in particular, focus on satellite technologies and electric propulsion.



27 September 2011: the ESA Harwell team sent a representative to a joint collaborative workshop on the subject of *Managing Industry-University Links*, organised by the Centre for Business Performance (CBP) at the University of Cambridge and the Tanaka Business

School of Imperial College, London. The workshop was supported by the UK Advanced Institute of Management (AIM) Research, the UK Innovation Research Centre (UKIRC) and the European Commission.

Universities and firms increasingly form large university-industry centres as focus for long-term alliances. In this workshop, brand new research on the management of university-industry centres at the University of Cambridge, Imperial College, London and the University of Warwick was presented.

University-industry centres are usually located at universities and carry out research in collaboration with firms. They allow firms to access to state-of-the-art knowledge and public grants, and bring additional resources into universities.

Yet, these centres sit alongside the traditional academic departments, and pursue both academic and industrial goals. There are real challenges relating to the ability of universities to deliver business-relevant outcomes, the control of intellectual property, conflicting time-scales and people management.

The workshop enabled the participants to discuss successful centre practices and the potential pitfalls with the major themes including:

- How to envision, resource and implement centres
- How to achieve the best fit between academic research and corporate R&D
- How to organize successful centres and maximize benefits for both firms and universities
- How to assess centre performance

As a result of the ESA participation, the Harwell team was invited to send a delegate to the UK Innovation Research Centre-(UK-IRC) sponsored Innovation Summit (at the IBM Hursley Centre) in November. The team intends to sustain its awareness of the UK innovation scene in the future as part of its ongoing remit to look at new ways of doing business in the ESA context.

<http://www.ukirc.ac.uk/ukircinnovation%20summit2011presentations/>

<http://www.aimresearch.org/about-aim>

STARTIGER/Seeker

A UK-centred consortium lead by *RAL Space* and supported by *SciSys*, *BAE Systems*, *Roke Manor Research* (all from the UK), *LAAS* (of France) and *MDA Space & Robotics* (of Canada) is now conducting a study and demonstration/evaluation project on future robotic autonomy under the STARTIGER programme. The project endeavours to meet the challenge of achieving a step change in autonomous capabilities for rover platforms to demonstrate that high-speed (2+ km per day) large-scale robotic traverses are possible in unstructured, planetary surface environments.



The project will complete test and demonstration operations in a terrestrial Mars-analogue site, e.g. Chott el Gharsa in Tunisia, where fast traverses over 6+ kilometre ranges will take place. The image at left shows the robotic rover "INDIE" being tested on a simulated Martian surface.

Details of Seeker's development project were unveiled on 8 December at the Science & Technology Facilities Council (STFC) 7th Appleton Space Conference at the Rutherford Appleton Laboratory (RAL). UK Minister for Science & Universities – David Willetts – speaking via videolink at the conference said: *"Space captures the imagination of so many people, and it's excellent to see UK experts playing such a significant role in the groundbreaking STARTIGER initiative."*

The 7-month project will see the team work intensively to design a navigation system to enable a rover to navigate around Mars independently, covering at least 2km per day. The Seeker navigation system will allow a rover to react better to its surroundings and undertake experiments in more locations, enabling human understanding of Mars to take a major leap forward. It is also expected that Seeker technology will have potential terrestrial applications, particularly for harsh environments.

Kim Ward of RAL Space, the Project Director, said: *"The keys to Seeker's success will be imagination, application and team work.....Seeker's ability to work autonomously in hostile terrain will be crucial to extending our understanding of [Mars]."*

Enterprise Zones – Harwell

The UK government has announced a range of new Enterprise Zones which are expected to deliver 30,000 new jobs by 2015. These developments are supported by the provision of cheaper business rates, superfast broadband connectivity and simplified planning procedures.

A joint venture by global property group Goodman, the United Kingdom Atomic Energy Authority and the UK Science and Facilities Technology Council (STFC), the *Harwell-Oxford Campus* – which hosts the ESA Harwell Centre – played a leading role in the successful bid for Enterprise Zone status by the Oxfordshire Local Enterprise Partnership (LEP). The zone will include two of the UK's leading science and innovation hubs – Harwell-Oxford and Milton Park, which will increase the competitiveness of the area.

The successful bid is significant news for the ESA Harwell Centre as it will deliver 200,000 square metres of high-tech infrastructure development by 2015 with a declared objective to add around 8,500 high-value-adding jobs into the area, enriching the business ecosystem in which the ESA Harwell Centre is embedded.

The ESA Business Incubator at Harwell



The ESA Business Incubation Centre (BIC) which opened in December 2010 is a collaboration of ESA, STFC and STFC Innovations Ltd (SIL). SIL is a 100% STFC-owned subsidiary and is tasked to represent ESA's technology transfer activities in the UK. To date, ten start-up companies have been selected, which puts the ESA BIC Harwell well on target.

Two stakeholder meetings, including the UK Space Agency, ISIC, ESA, UK National Physics Laboratory, Nottingham University and Lloyds Bank, have taken place recently in order to position the ESA BIC as a focal point for technology transfer from the Space sector to start-up companies. An addition to the current contract is now being prepared which will focus on enhancing the impact of ESA BIC activities in Harwell.

http://www.esa.int/SPECIALS/Business_Incubation/

Micro & Nano Technology Centres



Micro Electro-Mechanical Systems (MEMS) are becoming increasingly common in engineered products. These products cover a vast array of markets, from automotive safety to consumer gaming

electronics. Their use in space-based products, however, has been limited.

To address this issue a workshop was held at ISIC on 3 November 2011 whose objective was to identify and promote clear and effective routes for the exploitation of MEMS devices, originally developed for industrial applications, in space and, where applicable, vice versa. It was jointly organised by ESA, STFC and the UK Knowledge Transfer Networks (KTN) for Aerospace and Nanotechnology. Industrial representatives attended along with STFC, ESA, TSB and UK Space Agency staff in what was a landmark meeting in MEMS for space.

The workshop was wide-ranging and constructive, covering areas as diverse as manufacturing volumes, qualification & testing, systems heterogeneity, and the integration of supporting technologies. A detailed report will be published in early 2012. The primary conclusions drawn from the deliberations included the need to improve the linkages/processes between people with the technologies and those wishing to commercialise them in space.

The report will start the process to identify key technologies and inject information onto the National Space Technology Roadmaps, thus achieving better visibility on capabilities, technologies, competences, facilities in order to focus UK public funding in critical areas. From this basis the definition of the UK role in Europe-wide initiatives for MEMS use in space will be forthcoming.

2011 ESA Investment Forum

2 November 2011: participants in the European space innovation scene gathered in Harwell, UK for the 6th edition of the ESA Investment Forum. Organised by Europe Unlimited and hosted by the ESA Technology Transfer Programme Office (TTPO) and the UK Science and Technology Facilities Council, this forum was an exceptional setting for exploring investment

opportunities related to space services and technologies.

The ESA Investment Forum fosters investment and partnership opportunities by bringing start-up companies using space-related technology, applications or services in a non-space environment, together with finance and investment communities while highlighting the business potential of such relationships.

Motorsport Industry Association Exhibition

10 November 2011: Lord Drayson, former UK Minister for Science and Innovation and Managing Partner of Drayson Racing Technologies, who was instrumental in establishing the ESA Harwell Centre alongside ESA Director General Jean-Jacques Dordain, returned to the Harwell-Oxford Campus to address the UK *Motorsport Industry Association* exhibition at the International Space Innovation Centre.

The event showcased both motorsport and space sector technologies and companies and provided an active forum for discussing the potential for innovative joint technology ventures and technology transfer opportunities.

Particular areas of interest for Space-Motorsport future liaison appear to be focused in materials technologies, energy and power management and advanced electronics.

Economic Impact of Innovation Centres in Harwell

A study of the economic benefit of the innovation environment in Harwell, including the ESA and ISIC centres, was kicked-off during October. The object of the initial scoping study is to identify the stakeholders for the impact assessment programme and to build a “community-of-interest” in the future phases of this project whose targets include the development of a viable model for annual business/economic impact assessments.

Isis Innovation has submitted a draft Economic Impact Report to the project sponsors, ESA, STFC and ISIC for review. The project sponsors would like to thank those who participated in the study. The final report will help to shape the future direction of space

sector developments at Harwell.

Education & Outreach

In coordination with the ESA Education Office, ESA Harwell supports initiatives related to the European Space Education Resource Office (ESERO) in the UK. ESERO responds particularly well to a focus in the UK on STEM (Science, Technology, Engineering and Mathematics) education subjects.

www.esero.org.uk

Erratum:

In the last issue of the ESA Harwell Newsletter (No.6 July 2011) we erroneously stated that the SiREUS rate sensor embarked on Cryosat-2 and built by a UK consortium comprising Selex Galileo, SEA and Atlantic Inertial Systems/Goodrich forms Europe’s first MEMS-based device used for space vehicle guidance, navigation & control, giving the impression that the subsystem is being used operationally. This is not the case – the MEMS rate-sensor package is undergoing in-orbit evaluation only and is not part of the suite of operational sub-systems on-board. The ESA Harwell team would like to thank Mr Richard Francis (Cryosat Project Manager) and his team for alerting us to the error.

INTEGRATED APPLICATIONS PROMOTION PROGRAMME



Applications Business Office

The Applications Business Office (ABO) is now fully operational, following the appointment of a section head on 1st November. The current complement of two will be increased early next year, starting with the recruitment of a research fellow (the closing date for applications being 7th December). As the ABO head was previously in the role of IAP Ambassador, this position is also being recruited, creating an opportunity to redefine its focus. This will be done to align with the major opportunities for IAP that have been identified both by a joint UK/ESA working group and by ESA's Business Case for IAP in Harwell, which is now nearing completion. A preliminary report on these opportunities was provided to the main Harwell Working Group on 13th September and also to the UK Space Leadership Council, where it was positively received.

In parallel to developing the business case for IAP in Harwell, the ABO undertook joint leadership with the TSB of an applications working group to define the possible future activities and evolution of the IAP programme at Harwell. The group made its report to the main Harwell Working Group in September. These parallel activities have identified specific market sectors that appear to offer the greatest opportunities for integrated applications development and which meet criteria that include demonstrable benefits to both the UK and ESA. In-depth case studies have so far been developed for three of these sectors.

As noted in the last newsletter, the first sector studied was offshore renewable energy, where the UK has the largest market in Europe. The business case has identified improvements in the prediction of

wind energy output as the prime target for IAP activities and an open competition on this topic is planned for early next year. Other activities are expected to follow, hopefully in cooperation with the recently announced UK Technology Innovation Centre for Offshore Renewable Energy. Wave and tidal energy are also included in the sector, where the UK has world-leading capabilities including the European test centre (EMERC) in Orkney.

Insurance and carbon trading are the other two sectors that have so far been studied in detail. In the former case, the focus is on damage assessment and claims adjustment. In the latter case, the focus is on the evaluation and management of forest assets. The Ambassador Platform and the ABO have both been active in consultations with user communities and service providers, resulting in the identification of specific new services and applications that should form the basis of future IAP studies and projects.

Maritime safety and security is the fourth area of major potential and is currently under study. These markets are interlinked with the marine insurance sector where the UK has the largest share of the global market and where major opportunities are identified for the future. Equally, all these markets are of pan-European importance and offer opportunities to both users and supply-side industry in other ESA Member States.

IAP Programme Ambassador Platform

The Ambassador Platform at Harwell has now been operating for two years; encouraging proposals from supply-side industry to the IAP continuously open call and engaging with user communities in order to develop open competitions that address their needs. Two open competitions developed by the Ambassador have led to recent invitations to tender (ITT): "Optimising Inter-modal Freight Transport through European Ports" closed in August, whilst the ITT for "Prediction, Monitoring and Alerting of Landslides and Subsidence Affecting the Transport Infrastructure" closed on 1st November. Contract negotiations for both are expected to be completed shortly.

Rail transport continues to be a strong theme, with the IAP Ambassador presenting to the Future Communications and Positioning Systems Advisory Group of the Rail Safety Standards Board in London in November. The focus was on the improvement of

INTEGRATED APPLICATIONS PROMOTION PROGRAMME



safety at railway level crossings and there was considerable interest among participants in contributing to the definition of an intended open competition on this topic. It was agreed to maintain regular contact on this and other rail safety matters.

Mobile services are also an area of increasing interest and the Ambassador presented IAP at the INMARSAT Portfolio Development Forum in October. Further discussions are being undertaken by the ABO with the aim of identifying promising areas for applications development projects within the mobile satellite services market.

The autumn has been a busy period for events, with the Ambassador presenting at the TSB's *Innovate 11 Conference* in London and at the G-STEP workshop on space services related to mapping in Leicester. These events were within a few days of Harwell hosting the joint ESA/Avanti workshop to promote applications development for the HYLAS satellite system. Proposals making use of the free capacity provided under this initiative are encouraged (to either ESA or Avanti), with the next deadline for submissions at the end of February 2012. The workshop was a good example of how IAP and the ARTES (Advanced Research in Telecommunications Systems) applications programme are making increasing use of the facilities available at ESA Harwell and the ISIC. This is set to continue with the 2nd Annual ESA Applications Workshop, which will be held at the ISIC on 19-20 April 2012.

www.avantiplc.com



UK Economic Outlook

Despite the economic crisis, the European space sector has fared relatively well since 2008. The cyclical nature of industry (i.e. the need to replenish the fleet of satellites regularly), the national imperatives, as well as the commercial success of some space-based services have contributed to the dynamism of the entire value chain – especially driven by the telecommunication sector.

The UK has a particular interest and strengths in the space telecommunications sector which has resulted in a relatively good financial position for those UK companies involved. Furthermore, the UK government, realising the capabilities of its space sector and seeing the potential for the sector to be a key driver in post-crisis economic growth and re-balancing of the economy towards high-technology, high-value products, has recently committed funding into various programmes at national level.

The OECD has identified planned reductions in public R&D and science budgets due to the financial crisis throughout Europe which could impact the European Space sector over the next five years. However, it appears that the UK is committed and able to maintain its levels of R&D spending over the period to 2015/16. This represents a “window of opportunity” for ESA to make the case that increased UK funding of ESA, in line with the UK Innovation & Growth Strategy (IGS) recommendation to double the UK ESA contribution in a ten-year timeframe, would offer additional opportunities for growth in the Space sector.

This potential is demonstrated by the willingness of the UK government to spend additional R&D funds on national space projects as evidenced by the recent €25 million funding of Surrey Satellite Technology Limited (SSTL) to begin development of the NovaSAR earth observation system. A perceived key element here is that this project can show immediate benefit as well as potential for longer-term growth opportunities.



Collaboration Nation Event

9 September 2011: the Space Knowledge Transfer Network (KTN) Special Interest Group along with the Technology Strategy Board held the first Collaboration Nation event at ISIC. The event showcased the innovative technology projects and companies who were winners of the Technology Strategy Board's Space Feasibility Study Competition, bringing them together with innovators and the funding community to collaborate and bring new ideas to market.

Seventy-six organisations presented their findings from the studies in three-minute pitches during two parallel sessions. This format aimed to enable each organisation to connect with as many other companies as possible to seek further investment, further collaborations and greater market opportunities.

Innovate 11

11 October 2011: the Technology Strategy Board's annual conference/exhibition and networking event – *Innovate 11* – took place at the Business Design Centre in London. Over 2500 people attended the event and heard key note speeches from business leaders and UK government ministers on the importance of innovation as a way to grow sustainably out of the economic downturn and to compete effectively in future global markets. The Technology Strategy Board space sector activity was well-represented with eleven space-related companies exhibiting across the theme areas of Energy, Digital, AgriFood, Built Environment, Transport, and High-Value Manufacturing.

A “Space Cluster” of public sector partners was also present including the UK Space Agency, ESA, ISIC,

ISIC-Surrey and the Space Knowledge Transfer Network Special Interest Group.

A seminar on “*What makes a successful entrepreneur in Space*” was well-attended and included talks from Alan Brunstrom, the ESA IAP Ambassador, Ben Partridge of ISIC-Surrey, Ravi Kapur of Imperative Space and Michael Lawrence from the Technology Strategy Board.

National Space Technology Programme “Space for Growth” Competition

11 October 2011: the first €10.2 million of investment from the UK’s National Space Technology Programme was announced by the UK Minister for Universities & Science, David Willetts. This boost to the UK space sector will match-fund a range of projects with industry to develop commercial products and services using space technology or space-derived data.

The competition is funded by the UK Space Agency, in partnership with the Technology Strategy Board and the South East England Development Agency (SEEDA). Proposals are sought for projects that fall into one or more of the following market areas: Satellite Telecommunications; Sensing: Position, Navigation and Timing; Robotics and Exploration and Access to Space. All projects must be collaborative, business-led and have a clear route through to commercial exploitation.

‘Space for Growth’ will provide up to €2.3 million for flagship projects and up to €120,000 for smaller projects. The competition opened on 31 October and will be managed by the Technology Strategy Board. It will encourage businesses to work together to design new products and services and where appropriate make use of the facilities at the International Space Innovation Centre at Harwell and Guildford. Over 120 people attended a briefing day for organisations interested in taking part in the competition held at ISIC Harwell on 9 November.

New Telecommunications & Navigation Group set up by UK Space Agency

The UK Space Agency has established an industry

and public sector working group to produce authoritative advice for UK Ministers and the UK Space Agency. The initial focus of the group will be to review the opportunities for growth in overseas and UK space telecommunications and navigation applications markets. The group will also look at how the UK’s satellite communications and GNSS capabilities can be developed to deliver lower cost public services for overseas and UK customers.

The first meeting was held on 14 October and was attended by senior leaders from UK satellite manufacturers, satellite operators, telecommunications operators, investment banks, universities and government agencies including the Technology Strategy Board.

EADS Astrium UK CEO Appointed to TSB Governing Board



17 October 2011: UK Minister for Business, Innovation & Skills (BIS) – Vince Cable – announced four new appointments at the Technology Strategy Board (TSB). The newly-appointed board members are Colin Paynter (left), Ian Shott, Robert Sorrell and Mike Carr. They will

serve until 30 June 2014. Colin Paynter is the Chief Executive Officer of Astrium UK Limited, with activities covering satellites, space transportation, and space services. In addition to his UK duties, Colin has worldwide responsibility for Strategy and Business Development for Astrium covering Mergers & Acquisitions, Business Development and Strategy.

Secretary of State for Business Vince Cable, said:

“We are investing more than £1 billion in business led research and development through the Technology Strategy Board. These appointments provide an extremely strong mix of business talent, insight and experience. The new members will play an important role in ensuring that the Technology Strategy Board helps to drive economic growth by stimulating and supporting business-led technology innovation.”

The Chair of the Technology Strategy Board, Graham Spittle, said:

“I am glad to welcome the four new

*members....to support the important work of the Technology Strategy Board. It is essential that **high profile individuals with experience of the key business sectors** in which we are seeking to make an impact play a central role in the work that we do."*

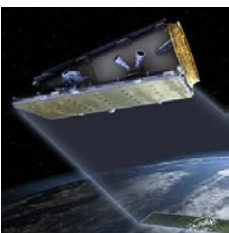
Next Generation Telecomms Platform

9 November 2011: European industry, supported by the European Space Agency and the French Space Agency (CNES), is embarking on the design and development of the next generation of 3 to 6 tonne class telecommunications satellite platform scheduled for launch in 2018.

This development will represent by far the largest commercial opportunity for the European space industry in the coming decade and the UK space manufacturing industry is working to ensure that it derives the maximum commercial benefit from this project.

The Technology Strategy Board hosted a workshop at ISIC for UK industry to describe the proposed platform development and the opportunities for UK participation. Presentations from CNES, EADS Astrium, ThalesAlenia Space and ESA provided an overview of the telecoms market, the industrial perspective and the role of ESA in supporting the programme.

NovaSAR



29 November 2011: David Willetts, Minister of State for Universities and Science, announced an investment of €25 million that will enable SSTL to launch a new space-based radar remote sensing programme, NovaSAR, which will offer powerful radar remote sensing capabilities and will target reduced costs relative to conventional radar missions. The UK government is providing the necessary seed-funding alongside industry to develop and build the first NovaSAR demonstration satellite possibly leading to a constellation of NovaSAR satellites similar to the highly successful Disaster Monitoring Constellation (DMC).

NovaSAR combines the heritage SSTL-300 series

avionics suite with a new structure and an innovative payload, developed in collaboration with EADS Astrium, which can be adapted to different frequency bands. NovaSAR will deliver all-weather medium-resolution Earth observation data night and day by leveraging highly efficient S-band solid state technology. The platform is sized for a range of low-cost launch options.

<http://www.sstl.co.uk/novasat>

Bi-lateral Meeting & Signature of Sentinel-5 Precursor

7 December 2011: ESA Director General Jean-Jacques Dordain arrived in London for a bi-lateral meeting with the UK Minister for Universities & Science, David Willetts in order to discuss the preparations for the 2012 ESA Council of Ministers and to look further at the concepts for the future development of the ESA Harwell Centre. Also on the agenda were the role of UK in ESA, joint ESA-UK events planned for 2012, the future of the ExoMars programme, and the UK TechDemoSat programme.

Following the very successful discussions the Director General and the UK Minister witnessed the signing of the Sentinel-5 Precursor prime contract between ESA's Director of Earth Observation Programmes, Prof. Volker Liebig, and EADS Astrium UK Director for Earth Observation, Navigation & Science, Miranda Mills. The contract is a further indication of the revitalised role of UK in the European space sector.

7th Appleton Space Conference 2011

8 December 2011: The ESA Director General, Jean-Jacques Dordain attended the UK Appleton Space Conference at Harwell, making an address to delegates as part of the plenary session on Space Policy. The UK Minister for Universities & Science, David Willetts made an address via video link.

Other speakers included Dr. Philip Lee, UK Member of Parliament and Robert Cabana, Director of the NASA Kennedy Space Center.

<http://www.stfc.ac.uk/RALSpace/News+and+events/Appleton+Space+Conference/37478.aspx>

UK Satellite Applications Technology Innovation Centre

8 December 2011: during early 2011, the TSB technology innovation centres (TIC) overall strategy was published which confirmed that the Space sector is a candidate for the next phase of UK TIC roll-out. During the latter part of the year the TSB has focused on detailing the space TIC case, finalising a proposal for a UK “Satellite Applications Technology Innovation Centre.” The proposal was presented to the TSB board on 8 December and a decision at national government level is expected in January 2012.

Should such a technology innovation centre be launched on this round, the juxtaposition of the TIC and the ESA Harwell Centre will present a unique and timely opportunity for ESA to cooperate with UK space technology innovation projects within a revitalised UK space sector.

<http://www.innovateuk.org/deliveringinnovation/technology-and-innovation-centres.ashx>

TechDemoSat (TDS-1)



UK industry and academia are working together with Surrey Satellite Technology Ltd on a new and innovative satellite that will trial UK space technologies and hopefully help win substantial international business for the companies

collaborating on the project.

The TechDemoSat-1 platform, currently being manufactured, will function as an ‘in-orbit test facility’ for the UK Space Agency once launched in early 2013, qualifying onboard payloads and software.

The €5 million project is funded jointly by the UK government’s Technology Strategy Board (TSB) and the South East England Development Agency (SEEDA). The satellite is based on the SSTL 150 platform originally-developed for the Rapid Eye mission.

International Space Innovation Centre – Collaboration & Funding



Since its launch in May 2011, ISIC has focused on collaborating with government, industry and academia and developing a strong foundation in which all three sectors can work together more effectively.

ISIC’s first major milestone has been securing funding within the Space for Growth Collaborative Research and Development programme that will enable more organisations to work with the Climate & Environmental Monitoring from Space (CEMS) programme. The funding is part of a €10 million National Space Technology Programme provided by the UK Space Agency, Technology Strategy Board (TSB) and the South East England Development Agency. CEMS will play an important role in developing the UK’s global role in understanding and helping to predict the impact of climate change.

ISIC is well-positioned to support SMEs and other organisations in obtaining funding to use the ISIC facilities, which were specifically designed to help generate ideas for new technologies and innovative solutions. More information concerning ISIC-related funding opportunities can be obtained from:

geoff.busswell@isic-space.com

ISIC is now working with non-space organisations, promoting the use of space data within innovative applications, and how such applications can help their businesses. A significant part of the UK national infrastructure is supported by space systems. There remains further potential to increase the benefit brought by space systems and applications.



To unlock this potential ISIC, with its partners, is engaging with non-space companies, who may be unaware of the benefits of space, through targeted information forums, networking and facilitated workshops. These workshops are planned for early in 2012 and are tailored to specific market sectors, such as automotive, oil & gas, marine, security and transport.

The ISIC facilities have generated an increasing amount of interest from both the space and non-space community. Many organisations have used the ISIC facilities to hold events workshops and meetings and are all delighted with the facilities, with the “video-wall” and the Applications Innovation Centre (AIC) in particular.

For more information about ISIC workshops or facilities, please email: info@isic-space.com

Remote Sensing and Photogrammetry Society (RSPSoc)

At this year’s annual conference in Bournemouth in September, there was an appreciation of both the high technical standard and social events / discussions that brought people together. Check out other events at RSPSoc at: www.rpsoc.org

RSPSoc is developing a *SchoolsGIS* project that will be supported via the Kenneth Keir bequest. It is still being formed, but the aim is that any RSPSoc student member can become involved. The student should arrange to give a talk to year 12-13 pupils at a local school. RSPSoc will then provide support to the student and the school would be encouraged to join the Society so that they can access ongoing resources for teaching and learning, including a web GIS interface containing preloaded datasets. Further details can be found at: <http://schoolsgis.org/>



The ESA Harwell Centre has found its initial home at the Harwell-Oxford campus in Oxfordshire, UK. The impetus for the Centre is to help “bring ESA closer to the UK and the UK closer to ESA” to rectify what the ESA Director General termed the “UK anomaly”, referring to the relative under-representation of the UK within ESA optional programmes. The enhanced links between ESA and UK should help ESA formulate programmes that are more attractive for UK investment.

The ESA Harwell Centre Concept

Starting in April 2011 and culminating with a presentation to the ESA Director General in November, the UK Space Agency has developed its vision for the future of the ESA Harwell Centre, focusing on supporting innovation and space applications. The primary activities identified include: telecommunications & integrated applications, earth observation & climate change with a focus on data management and quality, and innovative technology development for exploration. A further key aspect of the UK Space Agency vision includes the deployment of the ESA Director for Telecommunications & Integrated Applications as head of centre as soon as 2014. In his meetings with the ESA Director General over the past year the UK Minister of State for Science & Universities – David Willetts – has re-iterated his full support for this ambition.

Throughout 2011 and in the context of the joint UK Space Agency / ESA Harwell Working Group, the ESA Directorates concerned with Harwell have prepared proposals in response to the evolving UK vision, detailing the capabilities, functions and expected staffing levels that could be

implemented at the Harwell Centre. These proposals were presented to the ESA Director General on 22 November.

On this basis the Director General informed the UK Minister at their bi-lateral meeting in December that he intends to formulate programme proposals by March 2012 foreseeing the opportunity for a significant UK role that if taken up would warrant development of the ESA Centre in Harwell in line with the UK vision.

The Centre Today

As it grows ESA Harwell is now becoming a recognisable “ESA Centre.” The ESA Business Incubation Centre (**BIC**) is fully-integrated and connected into the overall accommodation layout.

The resident team based at Harwell remains at 13 with a further 5 staff expected to arrive during the first half of 2012. The plan is for a total of 23 staff on site by the end of 2012. These staff arrivals will be housed in newly-refurbished areas adjacent to the current ESA offices to form a coherent workspace. A large number of essential services for the ESA Harwell Centre are provided by the UK Science & Technology Facilities Council with which ESA has very close and efficient links.

In close cooperation with the ESA Information Technology Department the IT services provided in Harwell are being finalised to ensure that ESA resident staff and visitors from other ESA establishments can connect seamlessly into the ESA corporate network.

Integrating Harwell into ESA

During the past two years the Harwell Project has worked to prepare infrastructure and communication systems so that ESA staff at the Harwell Centre can work in an ESA-like environment. Preparations are well underway to integrate the operations of the Centre into the ESA Directorate of Human Resources, Facility Management & Informatics (**D/HFI**), from which the ESA Centre obtains significant support.

Work is progressing well on the preparation of the Harwell Quality Management System (**QMS**) which documents the day-to-day procedures and processes for running the Centre. More than 50% of this work is now completed, leading to an audit

by D/HFI planned for April 2012. This audit will clear the way for the handover to D/HFI of responsibility for the Centre operations at the end of 2012.

The Security Operations Procedures (**SECOPS**), one of the key QMS documents which contains details of how the Centre complies with ESA security directives, has now been completed and awaits endorsement by the ESA Security Office.

Preparing the Future Infrastructure & Support

Based on current planning, it has been established that up to the time of the Ministerial Conference in 2012, the ESA Harwell teams can be housed in the existing building by taking over additional office space as required.

A Future Accommodation Study has been completed which evaluated the possible future accommodation options. These included modifications to existing buildings on the Harwell site and a completely new building. This study now provides all the elements necessary to support decisions to be taken regarding the future accommodation for ESA teams in Harwell.

CALENDAR OF EVENTS



Date	Event	Location
12/07/2011	Meeting on possible EGEP test bed extension for rail users	ISIC, Harwell
13/07/2011	ARTES 1 Workshop on Ten year forecast of European Space Centre	Harwell
18-20/07/2011	ESA/NASA Planetary Protection Workshop	Harwell
19/07/2011	Space TIC Orientation Day	ISIC, Harwell
19/07/2011	ESA Bilateral on Navigation	London
28/07/2011	FP7 Space Call Event	ISIC, Harwell
31/08-01/09/2011	STFC UK/China Workshop	Milton Keynes
08/09/2011	Space Leadership Council	Conference Centre, Victoria St., London
05-08/09/2011	Joint CEOI/NERC National Centre for EO (NCEO) Conference	Warwick
09/09/2011	TSB Collaboration Nation event	ISIC, Harwell
13/09/2011	Harwell Working Group Meeting	ISIC, Harwell
19-21/09/2011	Observing the Earth and Planets: The Next 50 Years Symposium	University of Leicester
19-23/09/2011	IGBP iLEAPS Open Science Conference	Garmisch, Germany
11/10/2011	Innovate 2011	Business Design Centre, London
12-13/10/2011	CEOI Challenge Workshop	Coseners House, Abingdon
12-14/10/2011	CCI Collocation 2 Meeting	Frascati, Italy
14/10/2011	Inmarsat Portfolio Development Forum	London
17-19/10/2011	ESA Fire Workshop GOFC Fire Meeting	Stresa, Italy
17-20/10/2011	QA4EO Workshop	Harwell
19/10/2011	ESA/Avanti Hylas Workshop	ISIC, Harwell
20/10/2011	5 th IAP Ambassador Platform Meeting	Paris
21/10/2011	5 th IAP Advisory Committee Meeting	Paris
24-26/10/2011	GEO Carbon Conference	Rome
31/10/2011	UK Nuclear Workshop	Leicester
01/11/2011	G-STEP Workshop on space/mapping services	Leicester
01/11/2011	ESA BICs Coordination Meeting	Harwell
01-02/11/2011	ESA Investment Forum	ISIC, Harwell
03/11/2011	MEMs Workshop	ISIC, Harwell
04/11/2011	UK Aurora Meeting	London
07-09/11/2011	CEOS Plenary 2011	Lucca, Italy
08/11/2011	e-Research South – Space Workshop	Harwell
22/11/2011	Harwell Working Group Meeting	Paris
22/11/2011	CEOI Training Workshop: SAR Technology and its Applications	Harwell
29/11-1/12/2011	European Navigation Conference	London
29/11-2/12/2011	IGBP SOLAS EO Ocean-Atmosphere Meeting	Frascati, Italy
05/12/2011	Space Leadership Council	Conference Centre, Victoria St., London
05-06/12/2011	Forum for Earth Observation Applications	Harwell

CALENDAR OF EVENTS



Date	Event	Location
05-09/12/2011	Globe Ice Phase III Users W/shop	USA
08/12/2011	7 th Appleton Space Conference	Harwell
13/12/2011	Parliamentary Space Committee Christmas Event	Houses of Parliament
15/12/2011	National Space Technology Roadmaps Refresh Workshop	University of Surrey
20/12/2011	IVA4D Workshop	Harwell
January 2012		
11-12/01/2012	Climate Monitoring Architecture Writing Group Meeting	Geneva
25/01/2012	SSTL – Opening of new facility	Guildford
25/01/2012	UK Space Agency Education and Skills Working Group Meeting	London
26/01/2012	Royal Aeronautical Society Lecture: China's Expanding Space Programme	London
February 2012		
16-17/02/2012	National Space Academy Symposium	NSC, Leicester
March 2012		
15-17/03/2012	The Big Bang (UK Young Scientists & Engineering Fair)	Birmingham
27-30/03/2012	National Astronomy Meeting	University of Manchester
April 2012		
19-20/04/2012	ESA ARTES Applications Workshop	Harwell
May 2012		
14-16/05/2012	CCI CMUG Integration Meeting	Toulouse
17/05/2012	UK Space Agency Education and Skills Working Group Meeting	London
22-24/05/2012	IAF/AIAA Global Space Exploration Conference	Washington, USA
June 2012		
21-22/06/2012	ESA & ISGP Microgravity Conference	Aberdeen
July 2012		
09-15/07/2012	Farnborough International Air Show – Space Day Conference: Tuesday 10 th July 2012	Farnborough
23-27/07/2012	IGARSS 2012	Munich
September 2012		
21/09/2012	UK Space Agency Education and Skills Working Group Meeting	London
October 2012		
09/10/2012(tbc)	Innovate 2012	London
December 2012		
06/12/2012	8 th Appleton Space Conference	Harwell