

2011 INTERNATIONAL WORKSHOP ON ENVIRONMENT AND ALTERNATIVE ENERGY

**"Global Collaboration in Sustainable Environmental and
Alternative Energy Strategies"**

Noordwijk, The Netherlands – November 15 - 18, 2011

Summary Report

for

National Aeronautics Space Administration (NASA)

&

Centro Para Prevenção da Poluição (C3P)

**2011 International Workshop on Environment and
Alternative Energy**

Executive Overview

The C3P & NASA International Workshop on Environment and Alternative Energy was held on November 15-18, 2011 at the European Space Agency (ESA)'s Research and Technology Centre (ESTEC) in Noordwijk, The Netherlands. The theme of the workshop was "Global Collaboration in Environmental and Alternative Energy Strategies". The workshop was held at ESTEC's conference center.

More than 110 individuals from eleven countries attended the workshop. For the first time since the inception of NASA-C3P workshops, a full day was dedicated to a student session. Fifteen students from around the globe gave oral presentations along with poster displays relating to the latest technologies in environmental and alternative energy strategies. Judges from NASA, C3P and ESA awarded plaques to the top three students.

In addition to the students, thirty eight U.S. and international subject matter experts presented on the following general environmental-related topics:

- Hazardous materials management and substitution in support of space operations
- Emerging renewable and alternative energy technologies
- Sustainable development and redevelopment
- Remediation technologies and strategies

The workshop also included a panel discussion on the topic of the challenges of operating installations across borders.

Throughout the workshop, attendees heard about the scope of environmental and energy challenges that industry and governments face. They heard about technologies for increasing energy efficiency and increasing use of renewable energy. They learned about ways companies and government agencies are using materials, processes, goods and services in a manner more respectful with the environment and in compliance with health and safety rules.

The concept of partnerships and their inherent benefits was evidenced throughout the workshop. Partnering is a key aspect of sustainability because sustainable development is complicated. Through formal presentations and side discussions, attendees commented on the need for continued exploration of joint projects of mutual interest.

**Summary Report for
NASA/C3P 2011 International Workshop on Environment and Alternative
Energy
Noordwijk, The Netherlands
November 15 - 18, 2011**

Introduction

Since the year 2003, Portugal's Center for Pollution Prevention (C3P) (Centro Para Prevenção da Poluição) has held an annual technical workshop for interchange and to help identify new project opportunities. In November 2011, C3P and the United States National Aeronautics and Space Administration (NASA) hosted a technical workshop at the European Space Agency (ESA)'s Research and Technology Centre (ESTEC).

This report summarizes the activities and key outcomes of the four-day workshop and adjunct meetings.

Background

As an international organization, C3P addresses key aspects of environmental sustainability through formulating, advocating, and implementing collaborative projects between Portuguese, European and United States governments and industries in areas such as materials substitution, remediation, renewable and alternative energy, and sustainable development, among others. C3P is comprised of two elements: ITB, which provides engineering and technical support; and ISQ, which supports the identification of pervasive needs and technologies across Portugal and Europe, as well as providing alternative material, technology identification and demonstration/validation testing.

C3P was established to facilitate partnerships not only between NASA and Portuguese government agencies, but also between various Portuguese, American, and European Small and Medium Enterprises (SME). C3P fosters multi-participant cooperation to avoid duplication of effort, costs, and technical risk in reducing or eliminating hazardous materials at multi-program contractor sites and the various national host installations.

The Portuguese Ministry of Environment and NASA recognize C3P per the *Joint Statement Between NASA and the Portuguese Ministry of the Environment Regarding Cooperation in the Field of Environmental Pollution Prevention Matters*, first signed on September 18, 2002.

On a day-to-day basis, C3P supports program managers, defense contractors and industries from Portugal and Europe, and in particular, the SMEs, in addressing multi-participant problems in the uses of hazardous materials, waste generation and disposal. The concept operations of C3P define a systematic, phased methodology for identification and execution of C3P projects.

NASA's Technology Evaluation for Environmental Risk Mitigation (TEERM) Principal Center is the primary U.S. government interface to C3P. TEERM supports NASA in demonstrating and qualifying new materials and processes to reduce risk to NASA's mission. TEERM accomplishes these efforts through an ever-growing list of domestic and international partners.

Overview of 2011 Workshop

NASA and C3P held an international technical workshop on November 15-18, 2011 at the ESA ESTEC facility in Noordwijk, The Netherlands. NASA TEERM provided primary coordination and management for the event. The workshop provided an excellent forum to showcase innovative and emerging pollution prevention and renewable energy technologies, share lessons learned, and identify new joint opportunities. More than 110 individuals from eleven countries attended the workshop. For the first time since the inception of NASA-C3P workshops, a full day was dedicated to a student session. Fifteen students from around the globe gave oral presentations along with poster displays relating to the latest technologies in environmental and alternative energy strategies. Judges chosen from NASA, C3P and ESA awarded plaques to the top three students.

A welcome reception was held the night before the workshop commenced during which the Mayor of Noordwijk gave a presentation on the city. The ESA Conference Bureau provided special lodging rates for workshop attendees. Transportation was provided from the selected hotels each day to and from ESTEC to eliminate the need for vehicle rentals.

Following is a summary of each day's events.

Day 1

Opening Remarks

The workshop began with a general session led by distinguished speakers from NASA, C3P and ESA. Nathalie Meusy, Head of the Coordination Office on Sustainable Development of ESA, welcomed all participants and guest speakers. Olga Dominguez, NASA Assistant Administrator for the Office of Strategic Infrastructure, and General Castelo Branco, Director of C3P gave a brief welcome and highlighted recent environment and energy activities. The keynote address was given by Christer Fuglesang, Astronaut and Head of Science and Applications Division, ESA.

Panel Discussion

The Challenges of Operating Installations Across Borders: The panel consisted of Debra Dale, Chief, Environmental Division U.S. Army Installation Management Command (IMCOM)-Europe, Paul Cannock, Head of the Facility Management Department, ESA, and Gisela Suess, Head of the Institutional Law Division, ESA. This panel of experts led a stimulating discussion about the challenges of operating installations across international borders. Ms. Dale spoke about encroachment and building partnerships across borders. Mr. Cannock and Ms. Suess noted how ESA, being a European Union body, must follow EU directives and individual country regulations. The presentations and subsequent questions & answers provided awareness of the issues and examples of ways to proactively mitigate them.

Materials Management and Substitution in Support of Space Operations – Part I

The first session on Material Substitution covered several topics including materials substitution needs that have risen from both regulatory and obsolescence sources and specific topics including heavy metals replacements and alternatives in coatings, alternatives for toxic propellants and solvent replacements. Mr. Nikulainen and Mr. Rohr of the European Space

Agency's Materials and Components Technology Division reviewed these issues in detail, discussing how European legislation and industry shifts in availability of materials affect ESA. Matthew Rothgeb of the NASA Technology Evaluation for Environmental Risk Mitigation Principal Center discussed NASA's historic and ongoing efforts to identify and test alternatives for hexavalent chrome containing surface treatments. Another NASA contractor, Mick Bilney, gave an overview of the scarcity of rare earth elements, which are used in high-tech applications such as high reliability electronics that can impact both government and private sectors within Europe and the United States. Lastly, Claire Tonon discussed how Astrium, an aerospace subsidiary of the European Aeronautic Defense and Space Company (EADS), provides civil and defense space systems and services worldwide. It was an excellent session and gave an opportunity for side discussions regarding green propellants as well as some insight into the realities of materials issues within ESA.

Day 2

Student Day

The second day of the workshop was devoted to student PowerPoint presentations followed by poster presentations. This full day of student involvement was very successful in providing opportunities for a diverse group of highly motivated students to impress the attendees with technology topics relevant to the workshop themes. A winning presentation by a University of California at San Diego student described the challenges of operating large data centers in an energy efficient mode by timely shifting data center loads between optimal locations. Other significant presentations covered biofuels development for aircraft and green activities in the islands of the Azores. It is anticipated that future workshops will further utilize a full day devoted to student presentations to encourage fresh thinking from environmentally sensitive students from around the world. Below is a list of the presentations given by students:

Presentation Title	Student(s)	University
Green Planet Architecture - A Methodology for Self Sustainable Distributed Renewable Energy Ecosystems	Nikita Saxena Anna Thomas	Tufts University Georgia Institute of Technology
Designing the transition to sustainable energy systems: The Green Islands Project in the Azores	Andre Pina	Technical University of Portugal
Space Based Geoengineering to Counteract Anthropogenic Climate Change	Russell Bewick	University of Strathclyde
Monitoring of the Triclosan in Foodstuffs	Joana Bernardo	New University Lisbon
Biofuels and Modern Aircrafts - New Technical Solutions for their Effective Interaction	Piera Carugno	Sapienza University of Rome
Alternate Fueled Combustor Sector Emissions	Nikita Saxena	Tufts University
Development of a Compact Microbial Fuel Cell for Isolated Environments	Luciana Peixoto	University of Minho
UV Radiation Control Methods	Divya Krishnamoorthy Durgadevi Ganesa Iyer	Mailam Engineering College
Alternate-Fueled Gas Turbine Engine Combustor-Sector Performance	Anna Thomas	Georgia Institute of Technology
Sky Imager Solar Forecasting for Microgrid Optimization	Bryan Urquhart	University of California San Diego
Microgeneration, Sustainable Implementation and Utilization	Dulce Manha	Instituto Politecnico de Leiria
Sound Levels Nearby an Eolic Wind Turbine	Tatiana Pardal	Instituto Politecnico de Setubal
Electrodeposition of CoNi Films for Supercapacitors	Rui Tavares	Technical University
A Top-Down Approach to Energy Saving in Data Centers	Filippo Seracini	University of California San Diego
Utilizing Green Energy Prediction to Schedule Mixed Batch and Service Jobs in Data Centers	Baris Aksanli	University of California San Diego

Following the PowerPoint presentations there was a late afternoon student reception during which students stood at posters they had prepared and discussed their research in-depth with individuals. Awards were given at the end of the reception to the following students based on the quality of their presentations:

1st place	Filippo Seracini	University of California, San Diego
2nd place	Piera Carugno	Sapienza University of Rome
3rd place	Andre Pina	Technical University Portugal

Day 3

NASA/ESA Sustainability Report

Nathalie Meusy, Head of the Coordination Office on Sustainable Development at ESA, and James Leatherwood, Director of NASA's Environmental Management Division, gave a report on how their agency is doing in incorporating sustainability in daily operations. Both NASA and ESA have essentially the same mission (peaceful exploration of space) and have similar philosophy to approaching sustainable development. Both agencies have a strong desire and plan to increase energy efficiency and increase the use of renewable energy. Both agencies have pledged to use materials, processes, goods and services that are more respectful to the environment and in compliance with health and safety rules. Also, as evidenced in part by this workshop and other sponsored training/educational forums, both agencies are stimulating the cultural change in attitudes that is needed to make sustainable development work.

Emerging Renewable and Alternative Energy Technologies Session

This session provided insights into U.S. and European perspectives on subjects of mutual interest in the area of ground-based renewable and alternative energies. Isabelle Duvaux-Béchon of ESA spoke about how alternative energy technologies and other advanced materials and processes developed for ESA's space program can benefit earthly energy challenges. Koen Schoots of the Energy research Centre of the Netherlands (ECN) reviewed methods and data on the determining the economics of fuel cells. Hilke Rösler, also with ECN, provided information and recommendations on where greenhouse gases can best be reduced in the transportation sectors. Al Sorkin with NASA TEERM spoke about a joint NASA-Navy-Air Force project funded by the U.S. Department of Defense for evaluating solar air conditioning of buildings. Jorge Gabriel of the Instituto de Soldadura e Qualidade (Institute of Welding and Quality) (ISQ) in Portugal spoke about wind turbine monitoring. Laurent Jauniaux of ESA, spoke about the development of sustainable building codes for use in several European countries with ESA facilities.

Sustainable Development and Redevelopment Session

Thursday's second session was on infrastructure development and redevelopment efforts that reduce impact on the environment. This session began with ESA's Health, Safety and Security Officer, Allesandro Gigante, discussing various technology, communication, reporting, and training initiatives ESA has implemented in response to current EU legislation. Next, ESA's Christophe Lasseur explained discussed space travel and colonization and specifically the MELISSA project, which is looking into the sustainable lifecycle involved in the growing, harvesting and cultivation of plants on Mars. A presentation by Mariana Pereira of Portugal's C3P described an ongoing effort between NASA and Portugal entitled ECOS which seeks to

increase the cooperation on sustainable construction between NASA and Portugal. Following on the heels of this presentation, Professor Paulo Ferrão talked about the Green Islands project in Portugal. Finally Mr. Alexandre Almeida of the Opway Group gave a presentation on sustainable construction involving premade modular units for everything from housing to office buildings. The session made good use of the topic and how it stems from legislation to technologies and processes which involve holistic approaches.

Day 4

Solar Energy Applications

Arnulf Dinkel from The Fraunhofer Institute in Germany spoke about applications for solar energy. He discussed the areas of research, development and services offered by Fraunhofer. Of considerable interest to the audience was Mr. Dinkel's discussion of Masdar City, Abu Dhabi. This new city was built with the goal of being a sustainable city providing the highest quality of life with the lowest environmental footprint. He discussed Fraunhofer's general approach to solar cooling systems modeling, which is also an area of interest to the United States and elsewhere. As such, the potential exists for sharing of solar system performance data between project teams in different countries, including one NASA solar energy project.

Materials Management and Substitution in Support of Space Operations – Part II

The second session on Material Substitution covered the topic of lead-free solder in electronics, both regulatory and technical issues. Augustin Coello-Vera of Thales Alenia presented his views on the outlook and activities that the European aerospace industry is doing to cope with the risks introduced by lead-free solder in electronics. He was followed by Brian Greene from TEERM who presented an update on the progress and preliminary conclusions from a joint U.S. military-aerospace project to test the reliability of promising lead-free solder alloys. It was the opinion of the presenters that there appears to be a difference in opinion about the magnitude and extent of the reliability risk in Europe vs. the United States. Many public institutions and much of industry in Europe seem to feel there is no serious lead-free problem or that the problem has largely been solved. In the U.S., the feeling seems to be that not enough is being done to understand the lead-free reliability risks, which they feel are real.

Remediation Technologies and Strategies Session

U.S. Army challenges in meeting remediation goals in European operations were described by Mary Kay Foley of IMCOM as:

- Maintain mission capability
- Good relationship with Host Nation
- Prudent use of cleanup funds

Her presentation also highlighted a case study of trichloroethylene (TCE) groundwater contamination at Kaiserslautern Army Depot in Germany.

Two NASA employees provided an overview of that agency's remediation issues. David Amidei described NASA's most significant remediation projects, highlighting key points such as:

- To achieve satisfactory cleanup in reasonable time, NASA sites will need to implement contaminant removal/destruction technologies that perform much better than those in place right now.

- NASA partnership with others who have similar situations is the most effective way to achieve its long-term remediation goals.

Following this presentation, Merrilee Fellows of NASA reviewed lessons learned in communicating with public and private stakeholders on NASA remediation efforts .

Finally, a novel thermal conduction remediation method for in-well combustion heat transfer developed by a Netherlands-based company was presented by the company's Marten Kingmans. He described how the technology uses a gas burner as both the heat source and for treating the effluent vapors.

Workshop Outcomes

Throughout the workshop, the concept of collaboration and its inherent benefits was stressed. Several desirable interactions occurred between presenters and attendees. Some examples include:

- In an informal discussion between Mr. Sorkin and ESTEC's Environmental Officer Michael Hall, NASA TEERM learned that ESTEC's campus had a green roof. Mr. Hall was receptive to sharing design details and lessons learned about their green roof with TEERM's green roof partners in NASA (JPL and LaRC), Portugal, and Germany.
- From the presentation by MIT-Portugal and side discussions with the presenter, TEERM sees an opportunity to introduce the Azores-MIT team to points of contact at Newfoundland's Ramea Island renewable energy project. Doing so could lead to exchange of project details and other technical information of mutual interest.
- From the presentation by the Fraunhofer Institute and subsequent follow up with a subject matter expert in Germany, TEERM has discerned there is mutual interest in sharing solar cooling technologies performance data and modeling approaches.
- The TEERM-initiated relationship with ESA astronaut and 2011 workshop keynote speaker Christer Fuglesang resulted in a stimulating presentation at the workshop, and planted the seeds for an ongoing relationship with ESA. While TEERM has yet to plan any specific future discussion topics with Mr. Fuglesang, he has stated that he likes the premise of NASA TEERM and the importance of NASA ESA relations and is open to collaborating on potential future projects of common interest to NASA and ESA.
- A presentation on green propellants by ECAPS President Matthias Persson raises the possibility of exploring a NASA TEERM project involving this technology. Follow-on discussions with Mr. Persson are answering some of TEERM's questions regarding the technology and potential prospects. Mr. Persson hosted TEERM Engineer Jahn Dussich at the Swedish Space Corporation and ECAPS Headquarters in Stockholm, followed by a visit to Swedish NanoSpace in Uppsala. Following these initial discussions, Mr. Persson extended an invitation to NASA representatives to meet again with more specific representatives within the Swedish and international space arena at the 12th annual International Conference on Space Operations in Stockholm during June for more in-depth discussions

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FINAL AGENDA

Monday, November 14

Tour the Port of Rotterdam – World Port Center – 8:00am - 12:00pm

Welcome Reception – Palace Hotel – 5:00 - 7:00pm

Presentation from the Mayor of Noordwijk, Jan Pieter Lokker

Tuesday, November 15

Welcome, Keynote Address 9:00 - 11:30am

Opening remarks—Olga Dominguez, NASA, General Castelo Branco, C3P,
Franco Ongaro, Giuseppe Morsillo and Christer Fuglesang of ESA

Panel Discussion – The Challenges of Operating Installations

Across Borders 11:30am - 1:00pm

Debra Dale, IMCOM, Paul Cannock, ESA, and Gisela Suess, ESA Partnership Attorney

**Materials Management and Substitution in Support of
Space Operations, Part 1 - 2:00 - 5:00pm**

Impact of Environmental Legislation on European Space Sector - an ESA View,
Mikko Nikulainen, ESA

Obsolescence Management for Materials and Processes, Thomas Rohr, ESA

NASA TEERM Hexavalent Chrome Alternatives Projects, Matt Rothgeb, NASA TEERM

Rare Earth Metals Scarcity, Mick Bilney, TEC

Development of Green Propellants – HPGP Technology, Mathias Persson, ECAPS

Solvent Replacement Activities, Claire Tonon, Astrium EADS

Wednesday, November 16

Student Presentations 9:00am - 4:30pm

Student Presentations and Poster Session on Related International and Domestic Research

Opening Remarks - Kai-Uwe Schrogl, ESA

Keynote – Francesco Emma and Leland Melvin of ESA

Student Reception and Awards Ceremony 4:30 - 7:00pm

Thursday, November 17

Keynote Address 9:00 - 9:45am

NASA/ESA Sustainability Report, Nathalie Meusy, ESA and James Leatherwood, NASA

Emerging Renewable and Alternative Energy

Technologies 9:45am - 1:00pm

Space Programmes Supporting Energy Challenges, Isabelle Duvaux-Béchon, ESA

Fuel Cell Economics, Koen Schoots, ECN

When and How to Decarbonize the Transport Sector?, Hilke Rösler, ECN

Concentrated Solar Air Conditioning, Al Sorkin, NASA TEERM

Wind Turbines Monitoring System, Jorge Gabriel, ISQ

Tour of ESTEC Facility 1:30 - 2:30pm

Sustainable Development and Redevelopment 2:30 - 5:00pm

ESRIN Experience, Alessandro Gigante, ESA

MELISSA Project, Christophe Lasseur, ESA

ECOS Project, Mariana Periera, C3P

Green Islands – A Pathway to Energy Sustainability, Prof. Paulo Ferrão, MIT-Portugal

Building Configurator: A Sustainable Solution, Alexandre Almeida, Opway Group

Friday, November 18

Keynote Address 9:00 - 9:45am

Solar Energy Applications, Arnulf Dinkel, Fraunhofer Institute

Materials Management and Substitution in Support of

Space Operations, Part 2 - 9:45 - 10:45am

NASA/DoD Lead Free Electronics Project Status, Brian Greene, NASA TEERM

European Aerospace: Outlook and Activities to Cope with Lead Free Risks,

Augustin Coello-Vera, Thales Alenia Space

Remediation Technologies and Strategies 10:45am - 1:00pm

Installation Management Command Europe - Remediation Overview and Challenges,

Mary Kay Foley, IMCOM

NASA Remediation Overview and Challenges, Dave Amidei, NASA HQ

Communication and Stakeholder Involvement for Remediation: Lessons Learned,

Merrilee Fellows, NASA HQ

Thermal Technology to Remove All Organic Contaminants from Soil In Situ,

Marten Kingmans, TPS Technologies

2011 Workshop Check-in

Last Name	First Name	Organization	Affiliation	NASA HQ	NASA KSC	NASA Ames	NASA Contractor	ESA	Other Government	Student	Other <small>(e.g., industry, university)</small>	11/15	11/16	11/17	11/18
116 Total				5	1	1	7	66	4	18	14	78	59	72	35
MADEMBA-SY	Charles, Alexandre	ARIANESPACE	Other Industry								1			X	X
Fellows	Merrilee	NASA HQ	NASA	1								X	X	X	X
Amidei	David	NASA - EMD	NASA	1								X	X	X	X
Dominguez	Olga	NASA - EMD	NASA	1								X	X	X	X
Fischer	Holger	NASA - EMD	NASA	1								X	X	X	X
Griffin	Chuck	NASA - EMD	NASA		1							X	X	X	X
Leatherwood	James	NASA - EMD	NASA	1								X	X	X	X
Grymes	Rose	NASA Ames	NASA			1						X	X	X	X
DUSSICH	JAHN	ITB INC.NASA TEERM	NASA Contractor				1					X	X	X	X
Caldas	Carlos	ITB, Inc.	NASA Contractor				1					X	X	X	X
Greene	Brian	ITB-Inc.	NASA Contractor				1					X	X	X	X
Lamb	Michelle	ITB-Inc.	NASA Contractor				1					X	X	X	X
Rothgeb	Matthew	ITB-Inc.	NASA Contractor				1					X	X	X	X
Sorkin	Al	ITB-Inc.	NASA Contractor				1					X	X	X	X
Bilney	Mick	TEC, Inc.	NASA Contractor				1					X	X	X	X
Dinkel	Arnulf	Fraunhofer Institute	Other								1			X	X
Branco	Castelo	C3P	Other Government						1			X	X	X	X
Pereira	Mariana	C3P	Other Government						1			X	X	X	X
AMALDI	ANDREA	ESA	Other Government					1						X	
Baur	Carsten	ESA	Other Government					1							X
Blair	Sean	ESA	Other Government					1					X		X
Boissinot	Valentine	ESA	Other Government					1					X		
Brodsky	Yuval	ESA	Other Government					1					X		
Cannock	Paul	ESA	Other Government					1				X	X	X	X
Ferretti	Stefano	ESA	Other Government					1				X		X	X
Foing	Bernard	ESA	Other Government					1					X		X
Fuglesang	Christer	ESA	Other Government					1				X			
Giunta	Domenico	ESA	Other Government					1				X			
Guglielmi	Marco	ESA	Other Government					1					X	X	
Jacques	Lionel	ESA	Other Government					1					X		
LASSEUR	CHRISTOPHE	ESA	Other Government					1						X	
Lecuyot	Arnaud	ESA	Other Government					1					X	X	
Martin-de-Mercado	Gonzalo	ESA	Other Government					1				X			
Martinez de Aragon	Antonio	ESA	Other Government					1				X			
Morsillo	Giuseppe	ESA	Other Government					1				X			

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Last Name	First Name	Organization	Affiliation	NASA HQ	NASA KSC	NASA Ames	NASA Contractor	ESA	Other Government	Student	Other <small>(e.g., industry, university)</small>	11/15	11/16	11/17	11/18
Mossini	Luca	ESA	Other Government					1						X	
Nikulainen	Mikko	ESA	Other Government					1				X			
ONGARO	FRANCO	ESA	Other Government					1				X			
Pandolfi	Camilla	ESA	Other Government					1						X	
PERAT	Olivier	ESA	Other Government					1				X			
Prause	Juliane	ESA	Other Government					1					X		
Saint-Cyr	Pierre	ESA	Other Government					1				X	X	X	
Saterfield	Timothy	ESA	Other Government					1						X	
SIEMINSKI	TOMASZ	ESA	Other Government					1						X	X
Stragapede	Allessandro	ESA	Other Government					1					X		
Cannock	Paul	ESA	Other Government					1						X	
TJADEN	Joern	ESA	Other Government					1				X			
Walter	Christian	ESA	Other Government					1						X	
Wolff	mikael	ESA	Other Government					1						X	
De Parolis	Maria Natalina	ESA	Other Government					1				X		X	
ESPINASSE	Sylvie	ESA	Other Government					1				X			
Crippa	Giorgio	ESA - ESTEC	Other Government					1				X			
Taylor	Steve	ESA - ESTEC	Other Government					1						X	
Vivar y Cerrato	Maria de la Asuncion	ESA - ESTEC	Other Government					1				X			
Duesmann	Berthyl	ESA ESTEC	Other Government					1						X	
Sarasini	Carlo	ESA ESTEC	Other Government					1				X		X	
Harcier	Charlene	ESA-ESTEC	Other Government					1					X		
Holwerda	Benne	ESA-ESTEC	Other Government					1				X			
Jauniaux	Laurent	ESA-ESTEC	Other Government					1						X	
Kufner	Ewald	ESA-ESTEC	Other Government					1				X			
Lacombe	Dens	ESA-ESTEC	Other Government					1					X		
Lin	Chung-Chi	ESA-ESTEC	Other Government					1				X		X	
Masarotto	Valentina	esa-estec	Other Government					1				X			
Peinado	Noelia	ESA-ESTEC	Other Government					1				X			
Perez Luna	Jaime	ESA-ESTEC	Other Government					1				X			
RIJNSENT	COR	ESA-ESTEC	Other Government					1				X			
Rohr	Thomas	ESA-ESTEC	Other Government					1				X	X	X	X
Suess	Gisela	ESA-ESTEC	Other Government					1				X			
Amador Monteverde	Jorge	ESTEC	Other Government					1				X	X		
HALL	MICHAEL	ESTEC	Other Government					1				X	X	X	
Barbier	Xavier	European Space Agency	Other Government					1				X		X	

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Chiappone	Marco	European Space Agency	Other Government					1				X			
Delaval	Jessica	European Space Agency	Other Government					1				X	X	X	
Duvaux-Bechon	Isabelle	European Space Agency	Other Government					1						X	
Emma	Francesco	European Space Agency	Other Government					1					X		
Firth	Nicola	European Space Agency	Other Government					1				X	X	X	
GIGANTE	ALESSANDRO	European space Agency	Other Government					1				X	X	X	X
Humphrey	Sarah	European Space Agency	Other Government					1						X	
Innocenti	Luisa	European Space Agency	Other Government					1				X			
Meusy	Nathalie	European Space Agency	Other Government					1				X	X	X	X
SCHROGL	Kai-Uwe	European Space Agency	Other Government					1				X		X	
Vanden Bussche	Simon	European Space Agency	Other Government					1				X		X	
Dale	Debra	US Army	Other Government						1			X	X	X	X
Foley	Mary	US Army	Other Government						1			X	X	X	X
Tonon	Claire	Astrium Satellites	Other Industry								1	X			
Persson	Mathias	ECAPS	Other Industry								1	X	X		
Schoots	Koen	ECN	Other Industry								1	X	X	X	
Rosler	Hilke	ECN	Other Industry								1		X	X	
Rolloos	Marcus	EcoDrive Holland	Other Industry								1	X			X
Hautfenne	Celine	ESA	Other Industry					1				X			
Soares	Tiago	ESA	Other Industry								1	X			
Gonzalez Diaz	Sandra	ESA - ESTEC	Other Industry							1			X	X	
Trufero	Javier	ESA-ESTEC	Other Industry					1						X	
Gabriel	Jorge	ISQ	Other Industry								1	X	X	X	X
Ferrao	Paulo	MIT-PORTUGAL	Other Industry								1			X	X
Almeida	Alexandre	OPWAY GROUP	Other Industry								1			X	
Sindek	Nickel	TEC GmbH	Other Industry								1	X	X	X	X
Coello-Vera	Augustin	Thales Aleania Space	Other Industry								1				
Kingmans	Marten	TPS Technologies	Other Industry								1				X
Gutierrez	Jonathan Ivan Ramirez	ASSET - TU Delft	Student							1				X	
Monteiro	Nuno	FCT-UNL	Student							1		X			
Thomas	Anna	Georgia Tech	Student							1		X	X	X	
Manha	Dulce	Inst. Politecnico Leiria	Student							1		X	X	X	
Bernardo	Joana	ISQ UNL	Student							1		X	X	X	
Tavares da Silva	Rui Pedro	IST - TULisbon	Student							1		X	X	X	
Iyer	Durga Devi Ganesa	Mailam Engineering College	Student							1		X	X		
Krishnamoorthy	Divya	Mailam Engineering College	Student							1		X	X		

2011 Workshop Check-in

Last Name	First Name	Organization	Affiliation	NASA HQ	NASA KSC	NASA Ames	NASA Contractor	ESA	Other Government	Student	Other <small>(e.g., industry, university)</small>	11/15	11/16	11/17	11/18
Carugno	Piera	Sapienza - Uni of Rome	Student							1		X	X	X	
Pardal	Tatiana	Superior School of Technol	Student							1		X	X	X	
Campino	Alexandre	TU Delft	Student							1					
Saxena	Nikita	Tufts University	Student							1		X	X	X	
Urquhart	Bryan	UC San Diego	Student							1		X	X	X	
Seracini	Filippo	UCSD	Student							1		X	X	X	
Peixoto	Luciana	University of Minho	Student							1		X	X	X	
Bewick	Russell	University of Strathclyde	Student							1		X	X	X	X
Pina	Andre	UTL	Student							1		X	X	X	