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***Final Project Exhibition***

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**Abstract:**

This report describes the highly acclaimed CAPANINA project Final Exhibition which took place in Kings Manor during York HAP Week, October 2006.

The CAPANINA Final Exhibition included presentations on all the research topics covered during this three year project from all the partners. Exhibits were provided, with working demonstrations, including the payload equipment from the Stratospheric free-flight balloon trial in Sweden in August 2005. Behind each exhibit, large explanatory posters were displayed.

All the presentations were video recorded and nearly all are available, with restricted password protection, on the web site [www.yorkhapweek.org](http://www.yorkhapweek.org). Similarly the PowerPoint presentations are also available.

To complete the picture, the presentations given during the rest of the week, for the Applications Seminar and the HAPCOS workshop, are included.

**Keyword list:** HAPs, broadband, RF, optical, communications

## Document History

Date	Revision	Comment	Author / Editor	Affiliation
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## Document Approval (CEC Deliverables only)

Date of approval	Revision	Role of approver	Approver	Affiliation
18/12/06	01	Editor (Internal reviewer)	David Grace	UYOY
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## LIST OF ACRONYMS

<b>Acronym</b>	<b>Meaning</b>
CAPANINA	Communications from Aerial Platform Networks delivering Broadband Communications for All
HAPs	High Altitude Platforms
RF	Radio Frequency
FAQs	Frequently Asked Questions
EU	European Union
HAPCOS	High Altitude Platforms for Communications and Other Services

## **1. Executive Summary**

The CAPANINA project, with funding provided under the EU Framework Programme 6, has carried out research over a three year period into the provision of broadband communications from High Altitude Platforms (HAPs). HAPs are unmanned aerial vehicles flying, but remaining in an almost static relative position, some 20 km above the surface of the Earth. The primary purpose is to improve broadband access for both urban and rural communities, in Europe and on a global scale, alongside the existing technologies of terrestrial and satellite communications.

To mark the culmination of the project and to present the work done, an Exhibition was organised by the project coordinator (The University of York) as part of a week-long conference on HAPs called York HAP Week. This report describes the CAPANINA Final Exhibition which took place in Kings Manor at the University of York in the last week of October 2006.

The CAPANINA Final Exhibition included presentations on all the research topics covered during this three year project from all the partners. Exhibits were provided, with working demonstrations, including the payload equipment from the Stratospheric free-flight balloon trial in Sweden in August 2005. Behind each exhibit, large explanatory posters were displayed.

All the presentations were video recorded and nearly all are available, with restricted password protection, on the web site [www.yorkhapweek.org](http://www.yorkhapweek.org). Similarly the PowerPoint presentations are also available. These may be accessed by clicking on the appropriate reference in the text.

To complete the picture, the presentations given during the rest of the week, for the HAPs Applications Seminar and the HAPCOS workshop, are also included in this report.

## 2. Introduction

A need has been identified for the provision of improved broadband services in Europe, particularly for rural communities and high-speed transport, where existing terrestrial and satellite communications were either too expensive or technically limited. There is a major global opportunity for this technology as well, the exploitation of which would be to the benefit of European industry.

By providing a number of aerial vehicles, supporting transmitting equipment linked to the ground and to each other by optical or radio frequency links, in the stratosphere, improved faster communications can be provided.

Typically a High Altitude Platform (HAP) is an airship or plane that floats at an altitude of around 20km, well above any normal aircraft but being in the stratosphere, substantially below orbiting satellites. Therefore, as it is ten times nearer the Earth's surface, the resultant communication delay is substantially less than from a satellite.

As well as every-day improved communications, HAPs also can provide services for other applications. Most significant would be to provide emergency services for disaster relief, say immediately after an earthquake. By flying a plane to a position directly over the disaster epicentre, full telecommunication and television links can be provided instantaneously, irrespective of damage done to the infrastructure. High performance cameras on HAPs could also provide far better resolution camera images, due to the proximity to the earth, than from satellites. These can be used for weather observations, particularly for studying the growth and development of hurricanes and tornados in real time. Remote monitoring can also be effective for forest fire detection, initiating traffic congestion remedial measures and monitoring inappropriate land use, such as illegal logging.

The CAPANINA project builds on the experience gained in the HELINET project, a forerunner to CAPANINA, funded in the EU FP5 programme. HELINET looked at 3 potential applications, broadband communications, environmental monitoring, and remote sensing. Many of the current partners in CAPANINA were also members of HELINET.

To encourage and inform decision makers across Europe, and to disseminate the knowledge gained in the CAPANINA project, it was decided to hold a conference on the applications of HAPs and to include a full set of presentations on the research and experimental trials undertaken. This report lists the presentations and exhibits displayed during the conference as well as providing links to the full contributions should the reader wish to find out more.

### 3. Presentations

In order to access the following references to the presentations given during HAP Week, you may need to provide a username and password after clicking of the link.

Username = capaninaD30      Password = capanina

## CAPANINA Final Exhibition

### Monday 23<sup>rd</sup> October 2006

**Welcome** – *Graham Long (UOY/YEC)*

**Introduction to CAPANINA** – *David Grace (UOY)* [\[link to presentation\]](#)

#### **Modelling the mm-wave HAP propagation environment**

(a) Short term HAP propagation channel simulator – *Emanuela Falletti (POLITO)* [\[link to presentation\]](#)

(b) 3 state mm-wave ray based channel simulator for trains – *Tomaz Javornik (JSI)* [\[link to presentation\]](#)

#### **HAPs Broadband Air Interface Design**

(a) Wireless standards to deliver symmetric 120Mbps services from HAPs – *Mihael Mohorcic (JSI)* [\[link to presentation\]](#)

(b) Enhancing air interface performance – *Marina Mondin (POLITO)* [\[link to presentation\]](#)

**Radio resource management & handoff for cellular architectures** – *David Grace (UOY)* [\[link to presentation\]](#)

#### **Broadband Networking for HAPs**

(a) Network architecture and protocols – *Tien Van Do (BUTE)* [\[link to presentation\]](#)

(b) Mobility architecture and routing – *Roman Novak (JSI)* [\[link to presentation\]](#)

**Free Space Optical Communications for HAPs**

(a) Optical terminal architecture for gigabit optical links – *Joachim Horwath (DLR)* [\[link to presentation\]](#)

(b) Attitude stabilisation performance testbed for inter-HAP links – *Thomas Dreischer (CSAG)* [\[link to presentation\]](#)

**Antenna and RF Development for HAPs & High Speed Vehicles I**

(a) Mm-wave mechanically steerable antennas – *John Thornton (UOY)* [\[link to presentation\]](#)

(b) Mm-wave mechatronic antennas for vehicles – *Qin Xu/John Farserotu (CSEM)* [\[link to presentation\]](#)

**Antenna and RF Development for HAPs & High Speed Vehicles II**

(a1) Signal processing aspects of HAP antenna – *Yuriy Zakharov (UOY)* [\[link to presentation\]](#)

(a2) Implementation issues of adaptive beamforming for HAP-to-Trains communications – *Emanuela Falletti (POLITO)* [\[link to presentation\]](#)

(b) Power amplifier linearization for HAP applications – *Eduard Bertran (UPC)* [\[link to presentation\]](#)



## Tuesday 24<sup>th</sup> October 2006

### HAPs spectrum sharing

- (a) Radio regulatory strategy for HAPs – *David Grace (UOY)* [\[link to presentation\]](#)
- (b) Technical contributions to spectrum sharing regulators – *Ryu Miura (NICT)* [\[link to presentation\]](#)

### System architecture design with multiple HAPs

- (a) Constellation design and planning for multiple HAPs – *Guanhua Chen (UOY)* [\[link to presentation\]](#)
- (b) Dynamic spectrum sharing for multiple HAP systems – *Yiming Liu (UOY)* [\[link to presentation\]](#)
- (c) Diversity enhancements from multiple HAPs – *Tomaz Javornik (JSI)* [\[link to presentation\]](#)

### Applications and Business models for HAPs

- (a) Introduction to applications and modelling approach – *David Grace (UOY)* [\[link to presentation\]](#)
- (b) Business models for broadband applications – the HAP centric and service provider centric models – *Pairoj Likitthanasate (UOY)* [\[link to presentation\]](#)
- (c) Market case study for Western Hungary – *Tien Van Do (BUTE)* [\[link to presentation\]](#)
- (d) Event servicing and disaster relief business models – *David Grace (UOY)* [\[link to presentation\]](#)

### Broadband HAP Roadmap – *David Grace (UOY)* [\[link to presentation\]](#)

### The CAPANINA Trials I

- (a) Introduction to the CAPANINA Trial Programme – *Marco Bobbio Pallavicini (CGS)* [\[link to presentation\]](#)

(b) Tethered Aerostat in Pershore, UK – *Mike Fitch (BT)* [\[link to presentation\]](#)

(c) Mobile Vehicle Trial in Suffolk, UK – *Mike Fitch (BT)* [\[link to presentation\]](#)

(d) The Odyssey (Global Observer Prototype) in Arizona, USA – *Hiroyuki Tsuji (NICT)* [\[link to presentation\]](#)

### **The Stratospheric Balloon CAPANINA Trial II in Kiruna, Sweden**

(a) Aeronautics & System Integration – *Marco Bobbio Pallavicini (CGS)* [\[link to presentation\]](#)

(b) Wireless Tests – *Andy White (UOY)* [\[link to presentation\]](#)

(c) Free Space Optics Tests – *Joachim Horwath (DLR)* [\[link to presentation\]](#)

**Wrap Up Discussion – Exploitation Opportunities** – *Graham Long (UOY/YEC)* [\[link to presentation\]](#)

# HAP Application Symposium

## Wednesday 25<sup>th</sup> October 2006

**Welcome** – Prof. *Brian Cantor, Vice Chancellor, University of York*

### Opening/Keynote

#### **The Potential of High-Altitude Platforms & the European Framework**

**Programme for Research** - *Rosalie Zobel, Director, Components and Systems, DG Information Society and Media, European Commission* [\[link to presentation\]](#)

### Applications I

**Broadband for All** - *Manuel Monteiro, Deputy-Head of Unit, Communication Technologies, DG Information Society and Media, European Commission*  
(presented by *Jorge Pereira*) [\[link to presentation\]](#)

**HAPS: A Service Provider's Perspective** - *Jon Wakeling, Strategic Market Analysis Unit, BT Group Chief Technology Office, British Telecommunications plc* [\[link to presentation\]](#)

### Applications II

**High Altitude Platforms - A flexible, fast-deployable, modular, multi-system, multi-service platform** - *Jorge Pereira, Principal Scientific Officer, ICT for Environment, DG Information Society and Media, European Commission* [\[link to presentation\]](#)

**Maritime Surveillance** - *Maurice de Langlois, Capability Manager, EDA* (presented by *Jorge Pereira*) [\[link to presentation\]](#)

### Major Non-European HAP Initiatives

**High Altitude Platform Aircraft at NASA - Past, Present and Future** - *John DelFrate, Business Development Office, NASA Dryden Flight Research Center* [\[link to presentation\]](#)

**NOAA's High Altitude UAS Plans and Activities** - *Albin J. Gasiewski, Director, NOAA-CU Center for Environmental Technology, University of Colorado at Boulder* [\[link to presentation\]](#)

**HAPs in Asia**

**HAP program update in Japan** - *Ryu Miura, Project Manager, National Institute of Information and Communications Technology, Japan* [\[link to presentation\]](#)

**R&D on HAPs in Korea** - *Ho-Jin Lee, Electronics and Telecommunications Research Institute, Korea* [\[link to presentation\]](#)

**Technology**

**Wireless communications delivery from HAPs – What can be achieved and when?** - *David Grace, Principal Scientific Officer, FP6 Project CAPANINA, University of York* [\[link to presentation\]](#)

**High Altitude Long Endurance Aerostatic Platforms: The European Approach and HALE D-20 Description** - *Per Lindstrand, CEO, Lindstrand Technologies Ltd*  
[presentations not available]

**Panel Discussion:**

European Commission  
European Defence Agency  
NASA  
NOAA  
Japan/Korea  
Lindstrand Technologies Projects

**Closing Remarks**

# First WORKSHOP of COST297 'HAPCOS'

## Thursday 26<sup>th</sup> October 2006

### 3rd formal COST297 Management Committee meeting Part I.

#### Plenary Workshop Session

- **COST 297 Brief Overview and State of the Art** - *Tim Tozer, University of York* [\[link to presentation\]](#)
- **USE-HAAS - Summary Findings** - *Patrick Hendrick, University of Brussels* [\[link to presentation\]](#)
- **The GEOSCAN HAP Project in Malaysia** - *Hemant Patel, Geoscan (UK) plc* [\[link to presentation\]](#)
- **The StratXX Project** - *Kamal Alavie, Strat-XX Holdings AG* [\[link to presentation\]](#)
- **Applications & State-of-the-Art of Optical Communications for HAPs** - *Markus Knapek, DLR* [\[link to presentation\]](#)
- **Discussion**

#### Parallel Workshop Sessions

##### WG1 (Radio Communications)

Chair: David Grace

**Improving network mobility in HAP networks** - *Andrej Vilhar, Roman Novak, Jozef Stefan Institute* [\[link to presentation\]](#)

**The Effect of High Altitude Platform Network Earth-to-Stratosphere Aggregate Interference to GEO Satellite Receivers** - *Vasilis F. Milas, Philip Constantinou MRL, National Technical University of Athens* [\[link to presentation\]](#)

**Interference analysis between HAPS and satellite in the band 47/48 GHz** - *Bon-Jun Ku, Electronics and Telecommunications Research Institute, Korea* [\[link to presentation\]](#)

##### WG2 (Optical Communications)

Chair: Markus Knapek

**WiMAX from High Altitude Platform Feed by Satellite - Outage Probability** - *Shlomi Arnon, Ben-Gurion University of the Negev, Israel* [\[link to presentation\]](#)

**Launch of Pico-Satellite with Laser Link** - *Shlomi Arnon, Ben-Gurion University of the Negev, Israel* [\[presentation not available\]](#)

##### WG3 (HAPs and other Applications)

Chair: Patrick Hendrick

**Comparison of Propulsion Options for a HALE airship** - *Patrick Hendrick & Laurence Halet, University of Brussels* [\[link to presentation\]](#)

**A Review of the Use of Textiles for Airships** - *J F Rives, Stratotex* [\[link to presentation\]](#)

**Design aspects for a stratospheric airship** - *K Alavi, StratXX-AG*

<p><b>A spectrum etiquette for future mixed HAP-terrestrial cognitive radio systems with minimum transmit power guarantees</b> - <i>Pairoj Likitthanasate, David Grace, Paul Mitchell, University of York</i> <a href="#">[link to presentation]</a></p> <p><b>Optimizing Downlink Coexistence Performance of WiMax Services in HAP and Terrestrial Deployments</b> - <i>Zhe Yang<sup>1</sup>, Abbas Mohammed<sup>1</sup>, David Grace<sup>2</sup> and Tommy Hult<sup>1</sup>, <sup>1</sup>Blekinge Institute of Technology, <sup>2</sup>University of York</i> <a href="#">[link to presentation]</a></p> <p><b>Capacity enhancement through efficient constellation planning for Multiple HAPs</b> - <i>Guanhua Chen, David Grace, Tim Tozer, University of York</i> <a href="#">[link to presentation]</a></p> <p><b>Dynamic Spectrum Charging Mechanism for a Multiple High Altitude Platform System</b> - <i>Yiming Liu, David Grace, Paul Mitchell, University of York</i> <a href="#">[link to presentation]</a></p> <p><b>Multi-HAP Deployment for UMTS</b> - <i>Panu Lähdekorpi, Tero Isotalo, Jukka Lempiäinen, Tampere University of Technology</i> <a href="#">[link to presentation]</a></p> <p><b>The Optimization of Antenna Power Roll-off for High Altitude Platform WCDMA Systems</b> - <i>Jaroslav Holis<sup>1</sup>, David Grace<sup>2</sup>, Pavel Pechac<sup>1</sup>, <sup>1</sup>Czech Technical University, <sup>2</sup>University of York</i> <a href="#">[link to presentation]</a></p> <p><b>Discussion on future spectrum bands for HAPs research</b></p>	<p><b>Optical Downlink from the Japanese LEO Satellite to the DLR Optical Ground Station - First Results</b> - <i>Markus Knapek, DLR, Germany</i> <a href="#">[link to presentation]</a></p> <p><b>Optical HAP-to-Satellite Communication at the Wavelength of 1,5µm</b> - <i>Franz Fidler, Walter R. Leeb Vienna University of Technology</i> <i>[presentation not available]</i></p> <p><b>Optical Inter-platform Scenarios at 500km distance</b> - <i>Hlias Kathmertzoglou, National Technical University of Athens, Greece</i> <a href="#">[link to presentation]</a></p> <p><b>Way Forward for WG2:-</b></p> <ul style="list-style-type: none"> <li>• Webpages</li> <li>• Future activity planning</li> <li>• Future STSMs.</li> </ul>	<p><a href="#">[link to presentation]</a></p> <p><b>Possible use of HAPs for pollution monitoring and other EO and space science applications</b> - <i>R.Siddans et al, Rutherford Appleton Laboratory</i> <a href="#">[link to presentation]</a></p> <p><b>Way Forward for WG3:-</b></p> <ul style="list-style-type: none"> <li>• Future developments and projects</li> <li>• Future STSMs</li> </ul>
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# Friday 27<sup>th</sup> October 2006

## Workshop Session

### WG1 (Radio Communications)

Chair: David Grace

**Beam-pattern optimization for cellular communications from High Altitude Platforms** - *Zhengyi Xu, Yuriy Zakharov, George White, University of York* [\[link to presentation\]](#)

**Multiple HAP and Polarization Diversity for Enhanced Data Rate Communications** - *Abbas Mohammed, Tommy Hult, Blekinge Institute of Technology* [\[link to presentation\]](#)

**Turbo-Coded Polarization Multiplexing for High-Altitude Platform Communications** - *Yu Deng and Alister Burr, University of York* [\[link to presentation\]](#)

**Implementation and performance evaluation of HAP based ACM procedure using Reed-Solomon decoder assisted switching** - *Miha Smolnikar, Tomaz Javornik, Mihael Mohorcic, Jozef Stefan Institute* [\[link to presentation\]](#)

**HAP-based broadband communications under WiMAX standards – A first approach to physical layer performance assessment** - *I.Palma, J.A.Delgado-Penin<sup>1</sup>, F.P.Fontan<sup>2</sup>, <sup>1</sup>Universitat Politecnica de Catalunya, <sup>2</sup>University of Vigo* [\[link to presentation\]](#)

**Measurement Trial in 3G and Millimetre Frequency Bands using Low Altitude Airship** - *Jaroslav Holis<sup>1</sup>, Pavel Pechac<sup>1</sup>, P. Valtr, and Vaclav Kvicera<sup>2</sup>, <sup>1</sup>Czech Technical University, <sup>2</sup>Testcom* [\[link to presentation\]](#)

### Discussion on future trials

**Wave Propagation Simulations at 48 GHz for HAPs Using Rainfall Radar Data** - *S. Zvanovec, Pavel Pechac, Czech Technical University* [\[link to presentation\]](#)

**A competitive analysis on the portable internet services in Korea: HAPS vs. terrestrial networks** - *Jaekyoung Ahn, SNUT, Korea* [\[link to presentation\]](#)

**Analysis and performance evaluation of integrated HAP/Satellite architectures** - *Michele Luglio, F. Mazzenga, C. Roseti, University of Rome 'Tor Vergata'* [\[link to presentation\]](#)

## Future Short Term Scientific Mission Proposals

## Plenary Workshop Session

- **Airborne Radio Stations - The Future Radio Regulatory Environment** - *Les Barclay, Barclay Associates Ltd.* [\[link to presentation\]](#)
- **High Altitude Platform Aircraft at NASA - technical details** - *John DeIFrate, NASA* [\[link to presentation\]](#)
- **HAP UAV developments for Hydrology, Hurricanes and Disaster Management** - *Albin J. Gasiewski, University of Colorado at Boulder* [\[link to presentation\]](#)
- **Japanese HAP programme: technical update** - *Ryu Miura, NICT* [\[link to presentation\]](#)
- **HAPS project in Korea** - *Ho-Jin Lee, ETRI* [\[link to presentation\]](#)
- **Discussion**

**3rd formal COST297 Management Committee meeting Part II.**



#### 4. Demonstrations and Exhibits

- CAPANINA trials:
  - Trial videos – *David Grace (UOY)*
  - Trial 2 – payload rig mock-up – *Andy White (UOY)*
  - Trial 2 – mm-wave WLAN and server payload (inc broadband demo) – *Andy White (UOY)*
  - Optical payload pod - *Joachim Horwath (DLR)*
  
- Antennas:
  - Mechatronic steering platform - *Qin Xu (CSEM)*
  - Mm-wave patch antennas - *Qin Xu (CSEM)*
  - Lens antennas - *John Thornton (UOY)*
  
- Propagation
  - 3–state propagation channel simulator software – *Tomaz Javornik (JSI)*
  - Short-term propagation channel simulator – *Emanuela Falletti (POLITO)*
  
- DSP implementation of ACM procedures for IEEE 802.16 – *Miha Smolnika (JSI)*
  
- Optical Transport Network dimensioning tool – *Andrej Vilhar (JSI)*
  
- HAP business modelling software suite – *Pairoj Likitthanasate (UOY)*

## 5. Posters

All posters are available on the CAPANINA website at the following address:  
<http://www.capanina.org/hapweekposters.php>

1. Power Amplifier Linearisation - *Eduard Bertran (UPC)*
2. Trial 2 Balloon and Flight Train - *Marco Bobbio (CGS)*
3. Optical Comms & Trials - *Joachim Horwath (DLR)*
4. Mechatronic steering platform & mm-wave patch antennas - *Qin Xu (CSEM)*
5. Optical Transport Network Dimensioning Tool – *Andrej Vilhar (JSI)*
6. DSP implementation of ACM procedures for IEEE 802.16 – *Miha Smolnikar (JSI)*
7. DSP Implementation of Multipath Equalisers for HAPS – *Gabriel Montoro (UPC)*
8. Lens Antennas – *John Thornton (UOY)*
9. HAP business modelling software suite – *Pairoj Likitthansate (UOY)*
10. Three state mm-wave channel for trains – *Tomaz Javornik (JSI)*
11. Short-term stochastic channel simulator for HAP communications – *Emanuela Falletti (POLITO)*
12. Partners – *David Grace (UOY)*

**6. Attendance List**

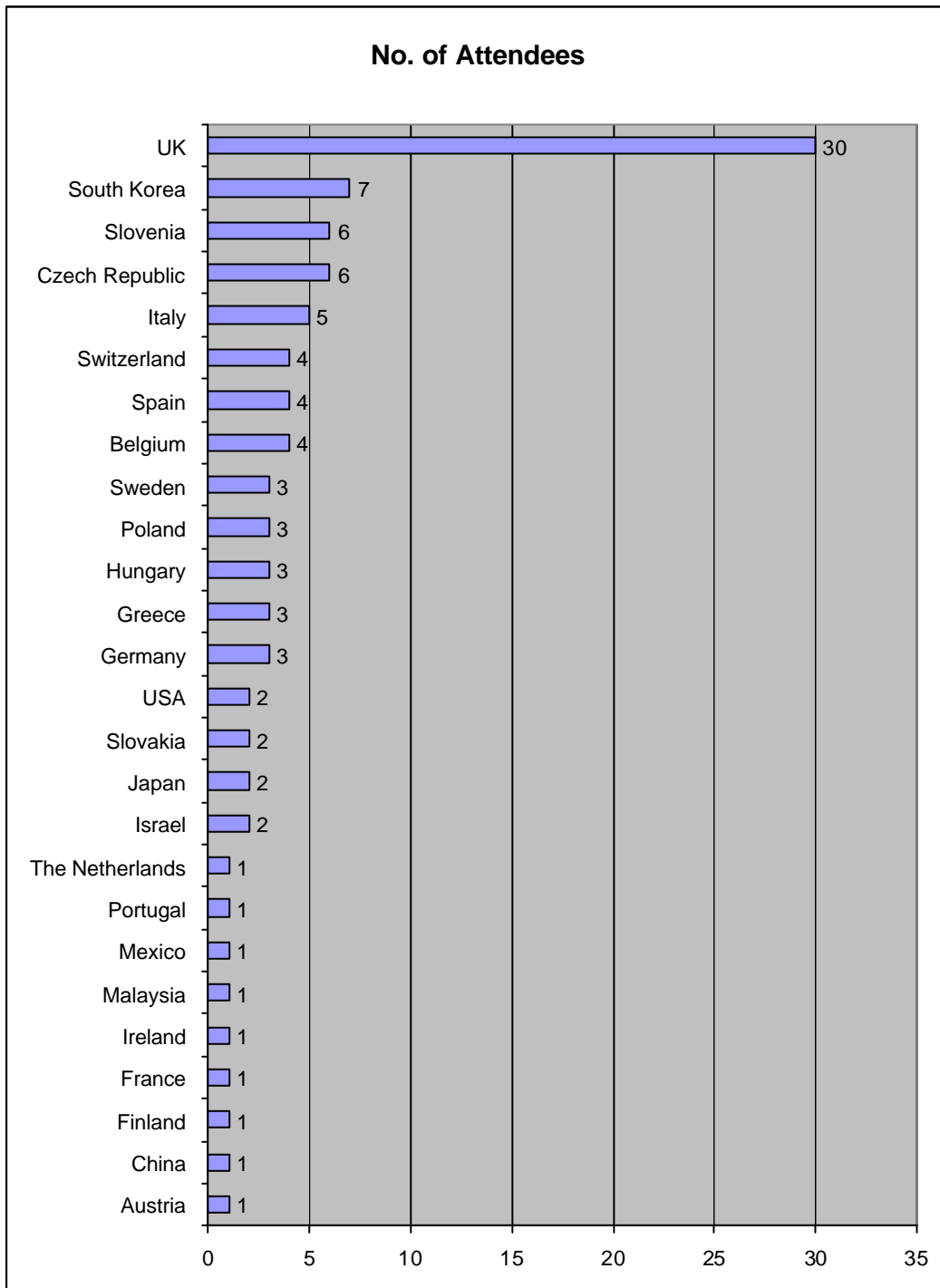
<b>Name</b>	<b>Institute/Organisation</b>	<b>Country</b>
Dipl. Ing. Franz Fidler	Vienna University of Technology, Inst. 389	Austria
Prof Patrick Hendrick	ULB	Belgium
Prof Claude Oestges	Université Catholique de Louvain	Belgium
Dr Jorge Pereira	European Commission	Belgium
Dr Rosalie Zobel	European Commission	Belgium
Miss Chenchen Wang		China
Mr Jaroslav Holis	Czech Technical University in Prague	Czech Republic
Mr Pavel Valtr	Czech Technical University in Prague	Czech Republic
Dr Pavel Pechac	Czech Technical University in Prague	Czech Republic
Mr Martin Grabner	TESTCOM	Czech Republic
Dr Vaclav Kvicera	TESTCOM	Czech Republic
Dr Rita Puzmanova		Czech Republic
Mr Tero Isotalo	Tampere University of Technology (TUT)	Finland
Mr JF Rives	Stratotex	France
Mr Joachim Horwath	DLR	Germany
Mr Markus Knapek	DLR	Germany
Mr Graham Worsley	DTI	Germany
Prof Niovi Pavlidou	Aristotle University of Thessaloniki	Greece
Prof Philip Constantinou	National Technical University of Athens	Greece
Mr Elias Katimertzoglou	National Technical University of Athens	Greece
Mr Gergo Buchholcz	BUTE, Department of Telecommunications	Hungary
Dr Tien Van Do	BUTE, Department of Telecommunications	Hungary
Mr Adam Gricser	BUTE, Department of Telecommunications	Hungary

<b>Name</b>	<b>Institute/Organisation</b>	<b>Country</b>
Dr Herve Andre Durand	Qucomhaps Ltd	Ireland
Prof Jacob Gavan	HIT	Israel
Dr Shlomi Arnon	Ben Gurion University	Israel
Prof Michele Luglio	University of Rome Tor Vergata	Italy
Dr Emanuela Falletti	Politecnico di Torino	Italy
Prof Fred Daneshgaran	EUROCONCEPTS S.R.L.	Italy
Prof Marina Mondin	Politecnico di Torino	Italy
Mr Marco Bobbio Pallavicini	CGS	Italy
Mr Hiroyuki Tsuji	NICT	Japan
Mr Ryu Miura	NICT	Japan
Mr Kulasegaran Sabaratnam	M/s Ranjit, Thomas & Kula	Malaysia
Dr Alejandro Aragon- Zavala	ITESM Campus Queretaro	Mexico
Mr Andrzej Malinowski	Siemens Sp. z o.o.	Poland
Dr Andrzej Kucharski	Wroclaw University of Technology	Poland
Dr Wojciech Krzysztofik	Wroclaw University of Technology	Poland
Prof Paulo Pinto		Portugal
Dr Pavol Galajda	TUKE	Slovakia
Msc Pavol Pavelka	TUKE	Slovakia
Mr Tomaž Javornik	Jožef Stefan Institute	Slovenia
Mr Andrej Vilhar	Jožef Stefan Institute	Slovenia
Dr Roman Novak	Jožef Stefan Institute	Slovenia
Prof Dr Gorazd Kandus	Jožef Stefan Institute	Slovenia
Dr Mihael Mohorcic	Jožef Stefan Institute	Slovenia
Mr Miha Smolnikar	Jožef Stefan Institute	Slovenia
Mr Do Seob Ahn	ETRI	South Korea

<b>Name</b>	<b>Institute/Organisation</b>	<b>Country</b>
Dr Ho-Jin Lee	ETRI	South Korea
Mr Yeonsu Kang	ETRI	South Korea
Mr Bon-Jun Ku	ETRI	South Korea
Mr Mun-Kyoo Jeong	SK Telecom	South Korea
Dr Jae-Kyoung Ahn	SNUT	South Korea
Mr Young-Heung Kang	SK Telecom	South Korea
Engineer Maria Munuera Gallardo	INSA	Spain
Prof Eduard Bertran	UPC - Tech. Univ. Catalunya	Spain
Prof Jose Delgado-Penín	UPC - Tech. Univ. Catalunya	Spain
Mr Israel Palma	UPC - Tech. Univ. Catalunya	Spain
Mr Tommy Hult	Blekinge Institute of Technology	Sweden
Mr Zhe Yang	Blekinge Institute of Technology	Sweden
Dr Abbas Mohammed	Blekinge Institute of Technology	Sweden
Mr Thomas Dreischer	Contraves Space AG	Switzerland
Mrs Qin Xu	CSEM SA	Switzerland
Mr Klaus Buchheim	Contraves Space AG	Switzerland
Mr Kamal Alavie	Strat-XX Holdings AG	Switzerland
Dr Catherine Morlet	ESA/ESTEC	The Netherlands
Mr Yiming Liu	University of York	UK
Dr Alan C Smith	QinetiQ	UK
Mr Mike Fitch	BT	UK
Mr Daniel Sola		UK
Prof Les Barclay	Barclay Associates Ltd	UK
Mr Bob Griffin	The Griffin Partnership LLP	UK
Mr Tim Tozer	University of York	UK
Dr Leigh Hodge	eCommerce Innovation Centre, Cardiff	UK

<b>Name</b>	<b>Institute/Organisation</b>	<b>Country</b>
	University	
Dr David Siddle	Dept. of Engineering, University of Leicester	UK
Mr Jon Wakeling	BT	UK
Dr Paul Mitchell	University of York	UK
Mr Andy White	University of York	UK
Dr David Grace	University of York	UK
Dr John Thornton	University of York	UK
Mr Guanhua Chen	University of York	UK
Mr Yu Deng	University of York	UK
Dr Yuriy Zakharov	University of York	UK
Mr Michael E. Rentell	The Airship Association	UK
Prof Jim Norton	Institute of Directors	UK
Mr Zhengyi Xu	University of York	UK
Dr Per Lindstrand	Lindstrand Technologies	UK
Mr Hemant Patel	Geoscan (UK) Plc	UK
Mr Pairoj Likitthanasate	University of York	UK
Miss Fern Ko	University of Portsmouth	UK
Mr Graham Long	York Electronics Centre	UK
Dr Chun Lu	SkyPluSys	UK
Mr Martin Pascoe	York Electronics Centre	UK
Dr Andrew Jackson	University of York	UK
Dr Richard Siddans	Rutherford Appleton Laboratories	UK
Prof Alister Burr	University of York	UK
Prof Albin Gasiewski	NOAA-CU Center for Environmental Technology	USA
Deputy Director, John Del Frate	NASA-DFRC	USA

Bar graph showing the geographical distribution of the attendees' affiliations.



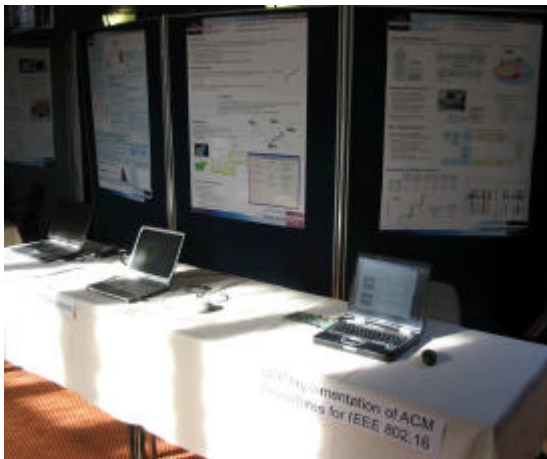
## 7. Photographs



Optical Payload Pod



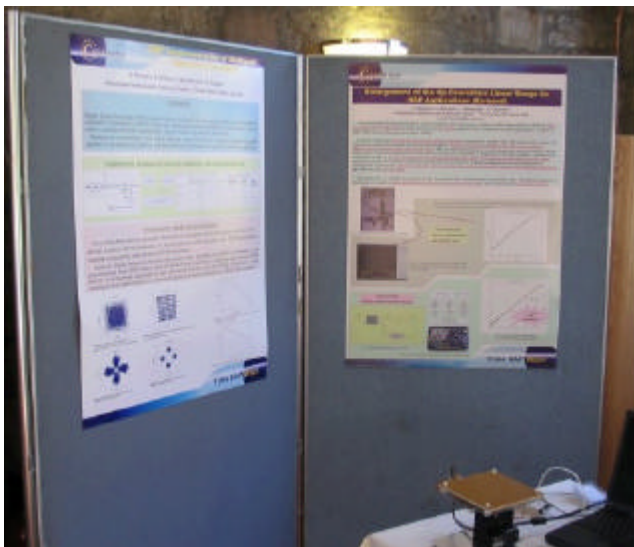
Trial RF and Optical Payload



DSP implementation of ACM procedures for IEEE 802.16



Lens antennas



Mechatronic steering platform & mm-wave patch antennas



Propagation Simulators





Trial 2 – mm-wave WLAN  
Ground Station Demonstration



Optical Transport Network Dimensioning Tool



Participants in the Exhibition area



Participants discussing presentations in the Exhibition area.



The CAPANINA Dinner in the Victorian Street of the Castle Museum, York

## **8, Conclusion**

This report has drawn together the contributions of all the partners in the CAPANINA project, complimented by presentations from international speakers of considerable renown in High Altitude Platforms.

The breadth and quality of the presentations, the exhibits, demonstrations and posters presented at York HAP Week gave an excellent appraisal of the current developments and the potential applications of HAPs.

As part of the CAPANINA dissemination exercise, it is hoped that this document will form a useful compendium of material which will be of benefit to both the York HAP Week attendees and to future readers.