FP6-IST-2003-506745 CAPANINA

Deliverable Number D25

Technology exploitation "Road Map"

Document Number	CAP-D25-WP50-YEC-PUB-01
Contractual Date of Delivery to the CEC	30th September 2006
Actual Date of Delivery to the CEC	12th October 2006
Author(s):	Graham Long, David Grace
Participant(s) (partner short names):	YEC (UOY), UOY
Editor (Internal reviewer)	John Farserotu
Workpackage:	WP5
Estimated person months	1
Security (PUBlic, CONfidential, REStricted)	PUB
Nature	R - report
CEC Version	1.1
Total number of pages (including cover):	8

Abstract:

This document is intended to guide and direct the reader, interested in the exploitation of technology associated with High Altitude Platforms for communications, to other much larger and more significant documents arising from the CAPANINA project. In particular, the "Road Map" for HAPs will be fully covered in D26 "Revised applications and services for BB HAP delivery" by the end of the project. The "Road Map" is currently covered in D12 "Strategy Document: Delivering Broadband for All including Commercial and Technical Risk Assessment" submitted earlier in the project (May 2005) and to be enhanced and augmented, taking into account business model aspects, in D26.

A number of the "exploitation ideas" currently under way and which may have application outside the HAP environment, will be covered in D29 "Plan for using and disseminating knowledge" to be submitted at the end of 2006.

Therefore the Executive Summary describes the opportunities for the technology and references for further, more detailed examinations, follow.

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

Document History

Date	**Revision**	**Comment**	**Author / Editor**	**Affiliation**
6 Oct 06	P01	Initial draft	Graham Long	YEC/UOY
12/10/06	01	First issue	Graham Long	YEC/UOY

Document Approval (CEC Deliverables only)

Date of approval	**Revision**	**Role of approver**	**Approver**	**Affiliation**
06/10/06	01	Editor (Internal reviewer)	John Farserotu	CSEM
12/10/06	01	On behalf of Scientific Board	David Grace	UOY

TABLE OF CONTENTS

LIST OF ACRONYMS

Acronym	**Meaning**
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
COST	CO-operation in Science and Technical research

1. Executive Summary

Within the CAPANINA project, technology exploitation falls into two areas. The first is concerned with promoting the concept of using High Altitude Platforms as a means of improving broadband access for both urban and rural communities, in Europe and on a global scale, alongside the existing technologies of terrestrial and satellite communications. It has been a primary driving force behind the CAPANINA project to carry out the necessary research to enable broadband communications to be brought to all. Significant work has therefore been carried out to this end – all of which is relevant to the exploitation of HAPs centred technology from the selection of the most appropriate communications standards, to the design and evaluation of electronic hardware and software for transmitters, receivers and signal processing and to the proving of the technology in the stratosphere. But perhaps the most relevant work has been to examine and analyse business models which will shape the structure and system design to really meet the end-users' needs so that the result is commercially viable.

A "Road Map" for HAPs will be fully covered in "Revised applications and services for BB HAP delivery" (D26) at the end of 2006, which follows on from the earlier "Strategy Document: Delivering Broadband for All including Commercial and Technical Risk Assessment" (D12) produced in May 2005.

In D26 [1], a suite of business models will be used to underpin the roadmap, allowing both service provider centric and HAP-operator centric perspectives to be examined. The different techno-economic parameters associated with different HAP technologies have been incorporated in the models, enabling the best HAP type – application pairings to be established. The business models are supported by market analysis for broadband services in the western Hungary region.

In D12 [2], the final section No. 10 of the document presents a HAPs broadband development roadmap, which takes into account the sub-strategies mentioned previously within this document and aims to minimise the development risk. A three-stage approach is at the heart of this roadmap, driven by the availability in platform technologies and the need to develop near-term (2-3 years) commercially attractive deployments, in order to kick-start the industry and realise its potential. In the near-term it is expected that HAPs will be used for capability demonstration, and for short term applications such as event servicing and disaster relief, this being mainly driven by the limited platform technology available today. Over the medium term (3-5 years), as the platform technology develops and the commercial confidence is built, they are likely to be used for longer missions in developing countries. As the technology is increasingly proven, HAPs broadband will deliver services to mobile users, acting as a complementary technology. Finally, as the technology matures, it will become an increasingly competitive technology, competing with satellite in terms of capacity and terrestrial in terms of coverage. Above all it is expected that HAPs technology will provide a vital role in the integrated telecommunication network of the future**.** As an example of technology exploitation for HAPs, the recent filing of a patent application to cover the novel beam steering technique developed at DLR will enable excellent pointing and tracking for inter-HAP optical communications. Having proved that a data

rate of 1.25 Gbit/s can be transmitted optically in Capanina Trial 2, this technology is ready for inter-HAP communications.

The main conclusion from both these documents is that HAPs will be complementary to terrestrial and satellite systems. Initially applications will fulfil limited niches, but as the platform technology develops, increasing numbers of scenarios and broadband applications will be possible. A key requirement for the success of the industry will be an integrated approach to both application and platform development. The costs associated with the development of the platform itself, coupled with similar platform requirements of many applications, indicates that a 'modular' platform be developed, where application specialists can mix and match the payloads to the mission in hand. This single family of multi-application platforms will help spread development costs and also benefit from economies of scale.

The increased interest within Europe in general in HAPs and their applications, is becoming apparent. Intellectual property from CAPANINA, primarily in the form of know-how, is being exploited in commercial projects such as StratXX [3], and Geoscan (UK) plc [4] is developing payloads for a manned HAP system for a number of missions. Through the University of York, the roadmap is being used by both projects to assist in their development timing. COST 297-HAPCOS [5] has been established to conduct further research into HAPs and their applications and contains a significant number of CAPANINA partners (UOY, POLITO, JSI, UPC, DLR, NICT). This will assist in the longer-term developments in particular, and brings together radio and optical communications and aeronautics.

The second potential technology exploitation area arising from the CAPANINA project is the possibility of using the technology arising from the research in fields other than for HAPs communications. For instance novel, steerable, RF antennas developed for the 28 to 31 GHz band to handle multiple beams can be re-dimensioned to work in lower frequency bands for transmitting and receiving satellite communications at moving or fixed ground stations. Similarly, the very high speed, high bandwidth optical systems developed for both inter-HAP and HAP-to-ground communication links could be used for aeroplane to satellite communications.

Exploitation ideas which may have application outside the HAP environment, are to be covered in D29 [6] "Plan for using and disseminating knowledge", to be issued at the end of the CAPANINA project (end of 2006). This document will list all the technical papers, presentations, potential ideas, further research areas and products arising from the CAPANINA project. It will follow the guidelines provided for the "Plan for using and disseminating knowledge" given in Appendix 1 to the EU Project Reporting Guidance Notes for FP6 [7].

In section 1 of D29 "Exploitable knowledge and its use", the exploitable results will be presented, where knowledge is defined as having a potential for industrial or commercial application in research activities or for developing, creating or marketing a product or process or for creating or providing a service. The dissemination activities (in section 2) will list activities in the form of a table with a short description for each major activity (technical paper, article, TV or radio broadcast, conference, exhibition, etc.) having taken place during the project. The third section of D29 will provide a publishable summary of each exploitable result which the project has generated,

provided the CAPANINA consortium is ready to publicise and has taken the appropriate measures to protect IPR. A number of patent applications have been filed.

2. References

1. "Revised applications and services for BB HAP delivery", CAPANINA Deliverable D26, http://www.capanina.org/DOCS/document_control.php?action=upload_doc&id=26

2. "Strategy Document: Delivering Broadband for All including Commercial and Technical Risk Assessment", CAPANINA Deliverable D12, http://www.capanina.org/DOCS/document_control.php?action=upload_doc&id=12

3. "StratXX Website", www.stratxx.com

4. "Geoscan (UK) plc Website", www.geoscanuk.co.uk

5. "COST 297 – HAPCOS Website", www.hapcos.org

6. "Plan for using and disseminating knowledge", CAPANINA Deliverable D29, http://www.capanina.org/DOCS/document_control.php?action=upload_doc&id=29

7. Appendix 1 to the EU Project Reporting Guidance Notes for FP6 ftp://ftp.cordis.europa.eu/pub/fp6/docs/appendix_1-4_en.pdf