WirelessCabin EC PROJECT IST-2001-3746

Personal Mobile Communications in Aircrafts
Maximum comfort while flying

Make and receive calls on your mobile telephone, Internet surfing, send and receive e-mails, read the most updated news, connect your laptop to your company private network.

All communication possibilities in your normal life will be also feasible while travelling by plane. With the Wireless-Cabin project it will not be an illusion anymore.

ìThe use of mobile telephones during the flight is not allowedì. We are all used to hear this sentence every time our flight is going to take off, but in a few years flight attendants will not announce this anymore. Nowadays aircraft are beyond one of the few still remaining boundaries which exist for personal communications, but once more, satellite communications will tear down this boundary. A satellite link can keep the connection between the on-board and the terrestrial network via a satellite antenna mounted on the top of the aircraft. And once you, as an aircraft passenger, know that can be on-line with the outside world, what would you like to do? Call your family to inform about a delay on your flight, check your e-mail before an important meeting. In a few words: act as you would do in your normal *terrestrial* life, without thinking on the limitations of being in a plane.

Benefits of the use of personal devices

Going even further and taking into account both, travellers' requirements and comfort and airlines' benefits, it would be desirable to provide the usage of personal devices (like mobile telephones, laptops or PDA), instead of in-built terminals on the aircraft seats. From the users' point of view, their service acceptance will be increased by the following facts: they can be reached under their usual telephone number, they may have available telephone numbers or other data stored in their cell phones or PDAs, their laptops have the software they are used to, the documents they need and with their personalised configuration (starting web site, bookmarks, address book). In addition, since users in an aircraft are people on the move, the electronic devices they carry with them are wireless, so the cabin area has to be designed as a radio network, instead of installing plugs in the seats. From the airlines' point of view there is a huge saving of the investment related to the installation of terminals (screens, stations, wired telephones), together with software licenses (in case of PCs) and further investments due to hardware updating to offer always latest technology to their customers.

'WirelessCabin' project

WirelessCabin, a research project coordinated by the Institute of Communications and Navigation, started in July 2002 with the objective to realise the use of mobile telephone and the wireless connection of laptops to Internet during the flight. The *WirelessCabin* project is being carried out by an European team of engineers with experience in all R&D areas

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relevant to achieve this ambitious goals. The companies involved are: Airbus Germany (aircraft manufacturer), Siemens Austria and Ericsson Italy (both from the network and mobile communications industry), Inmarsat from UK (satellite operator), the German cabin integrator KID-Systeme, the University of Bradford (UK) and the technology consulting companies ESYS (UK) and TriaGnoSys (Germany). Within the project duration of 30 months the consortium will investigate how the link between the flying network and the terrestrial networks can be set up via satellite. Besides communication issues also interference of passengers' personal electronic equipment with avionics systems will be examined.

Supported by a market survey with interviews to passengers and airlines, the development of the *Wireless-Cabin* project will derive a business model for aeronautical services. For this, the relations between the different players in the value chain will be studied (airlines, satellite operators, and service, content and aircom providers).

Offered services

The wireless access standards chosen for the cellular on-board network (depicted in the picture below) are UMTS, IEEE 802.11b (Wireless LAN) and Bluetooth: UMTS for personal telephony and packet data, Bluetooth and WLAN for IP access. Furthermore the final network architecture will be open to any other emerging standard.

As seen in the picture below, the wireless access solution is an added service for passengers, not replacing IP services through fixed terminals installed in the cabin seats.

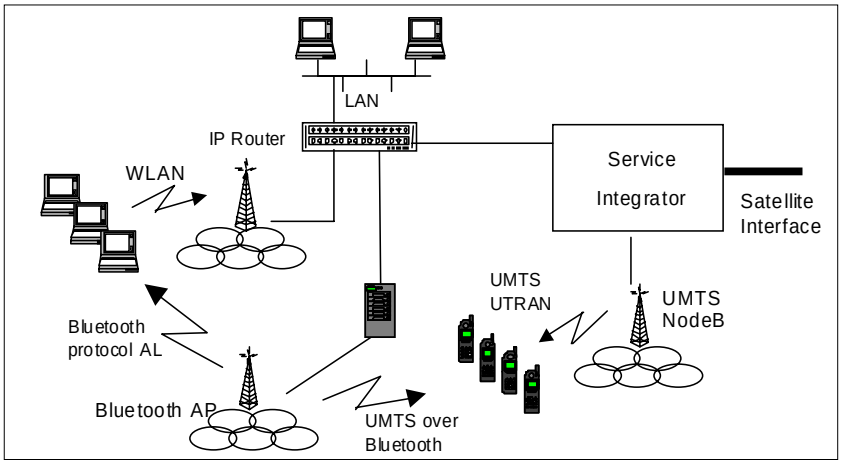
Research areas

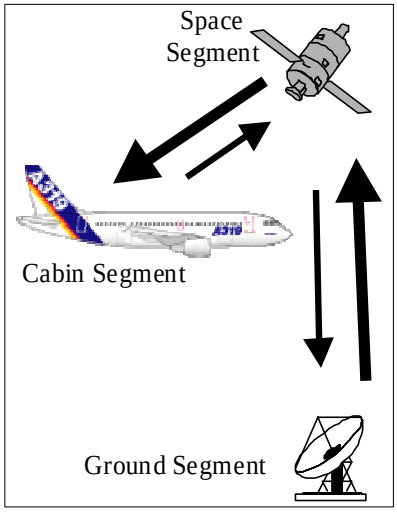
The activities within the project can be divided into four technical aspects covering the three segments of the overall system (cabin, space and ground segments).
These aspects are:
protocol development,
propagation and interference study,
topology and capacity planning
implementation in a final demonstrator.

The three protocol access methods must be integrated through a service integrator, allowing the separation and transportation of the services over a single (or several) satellite bearer(s). New protocol concepts have to be developed to support the integrated services with asymmetrical bit rate on satellite up- and down-link and dynamic bandwidth sharing among the services depending on the traffic demand. The signalling protocols of UMTS with respect to the longer propagation delay over the satellite link must be analysed, and an adaptation layer protocol to cope with these delay effects will be defined.

Handovers between different satellites and between spot beams of a single satellite have to be studied in order to keep the connectivity when the plane crosses different coverage areas.

Considering propagation aspects, a wideband indoor cabin channel model will be proposed based on the





statistics derived from measurements performed in an Airbus A340 and in an A380 mock-up. The different types of interference will be analysed and countermeasures will be developed. Also electromagnetic compatibility (EMC) analysis to achieve further certification will be considered. Based on these studies a coverage and topology planning will be done and optimal topology network configurations for different aircraft types and frequency re-use will be recommended, determining cell sizes depending on expected traffic.

In-flight demonstration

Finally a service integrator prototype will be developed and with the use of available commercial aircraft antenna, an in-flight demo will be performed by the end of 2004 in a commercial long-haul aircraft accessing the backbone terrestrial networks through a GEO satellite link.

Contact:

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Development and Demonstrator of Wireless Access for Multimedia Services in Aircraft Cabins

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On-board network architecture