



Case Study

Tropical UpLink

Project lead



Prepared by



Tropical UpLink

Overview

Communications in tropical environments are challenging, which has been a particular difficulty for the military for many years but also presents problems in the aftermath of disasters. The potential impact varies from country to country, but can be significant – for example in Malaysia two-thirds of the land is forest, according to The World Bank.

Crib Gogh, with its experience in designing and supplying extreme survival equipment, became aware of this need while working on other projects in tropical areas. With funding from the UK Space Agency's International Partnerships in Space Programme (IPSP), Crib Gogh worked with UK and Malaysian partners to develop a portable communications solution that can be taken anywhere to create a local mobile phone communications 'bubble' (based on the Global System for Mobile Communications, or GSM, standard) when other options either do not exist or become congested or fail.



Partners

- UK – Rolatube Technology, Bullitt Group, Roke Manor Research
- Malaysia – University Pertahanan National Malaysia (UPNM)

Challenge

Communications in or around the Earth's tropics, especially in regions with dense rain forest, jungles, deciduous woodlands, mangrove swamps and everglades, are notoriously difficult due to the high levels of water vapour in the atmosphere. Water vapour or rain can affect all communications systems to some degree. The atmospheric effects cause absorption of microwave radio frequency (RF) signals, with the losses especially prevalent at frequencies above 11GHz.

Communications can also be badly affected after disasters – due to damaged infrastructure and/or systems overload – which is when they are most vital in order to co-ordinate rescue and relief operations.

A solution is therefore needed that lets teams communicate with each other on the ground and includes, if possible, the potential for satellite-enabled communication. However, any solution also needs to be portable and lightweight enough to be carried by individuals.



The Tropical UpLink base station is around the same size as a 14 inch laptop

This was the challenge defined by the Malaysian Government, which wanted a solution for use during humanitarian disasters.

Solution

Crib Gogh designed a solution that was independent of any terrestrial ground infrastructure, so that it could be used anywhere in the world. The result is a mobile GSM base station that uses a lightweight, retractable mast that can be erected and used with an aerial to create a communications ‘bubble’ around the mast.

Up to four of these base stations can be linked together. Within the larger bubble that is created, any enabled GSM handset can talk to any other. One of the base stations acts a master station, with an uplink facility to one of the constellations of low or middle Earth orbit communications satellites, depending on its ‘backhaul’ device. A key feature is that the data uplink is completely encrypted, thus avoiding any potential hacking and maximising the performance of the response teams.

The mast, along with the rest of the communications kit, is small enough to fit into a 30 litre rucksack, making it easy to deploy. To make it cost effective and sustainable in the field, the base station kits can include spare batteries and solar mats, avoiding the need to replenish fuel and making it a less attractive target when fossil fuels are scarce.

In a field trial in Malaysia using one mast the Crib Gogh solution had a bubble diameter of approximately 200m from the mast through a bamboo curtain, while a trial in the UK managed a 10km diameter bubble. Eventually the system will offer communications over a diameter of 20km, which should be sufficient for disaster relief teams in most circumstances.

Applications include failsafe voice and data communications, streaming of images and video to operations centres, and video streaming of casualty injuries to seek medical advice remotely.

IPSP benefits

IPSP funding has enabled development of a portable communications system that can be used in tropical environments where mobile communications are either non-existent or difficult. The system also has applications in many other areas where alternative systems have failed or do not work well, and will be valuable for disaster response teams.

For this project the UK Space Agency, which managed the IPSP programme, played a key role, as it recognised the potential benefit of this system to people displaced by natural disasters



Members of the Crib Gogh team



Setting up the Tropical UpLink system



IPSP’s Ray Fielding, Head of International Space Programmes at the UK Space Agency, greets the Malaysian Minister of Science

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and put Crib Gogh in touch with relevant organisations in Malaysia and other countries. It also held workshops in the UK at which other UK agencies offered support for the project.

Outcomes & Future

The Tropical UpLink solution has been proven in trials and the team has also found a way of bouncing the information via an unmanned aerial vehicle (UAV) if there are problems with the uplink signal. In future it may be possible to increase the number of ground stations that can communicate with each other, if the additional coverage proves to be beneficial.



The Crib Gogh team, Ray Fielding and Malaysian ministers

The Malaysian Government is in negotiations to roll out the solution across several of its states where it has particular problems with flooding. More broadly, the Malaysian trial has prompted interest from the Association of Southeast Asian Nations (ASEAN) Humanitarian Assistance and Disaster Relief community. Crib Gogh and its partners are also looking at opportunities in South America.

Although the focus has been on providing a solution for use in tropical regions, Tropical UpLink could be used within developed countries too, where it could provide secure, encrypted, field-based communications between emergency services at sites where a secure mobile communications solution is required.

If a project involves testing and/or events in a foreign country, ensure that the country's customs agency will allow all the relevant equipment to be taken into the country – otherwise your project will not be able to move forward past this stage. Different countries have different rules: a number of countries, for example, will not allow you to take in satellite phones.

IPSP

The International Partnership Space Programme was a two year, £32 million pilot programme established and led by the UK Space Agency. The aim of the programme was to open opportunities for the UK space sector to share expertise in real-world satellite technology and services overseas and develop international partnerships for mutual benefit. The objectives for this programme were to show the benefits that UK satellite or space technology can provide above and beyond terrestrial solutions; these were provided in terms of societal or economic benefits, for countries that currently do not have these capabilities or wish to develop them further. The aims were for the UK to learn from partnerships with these countries and to establish the UK as the partner of choice with these countries once they are in a position to acquire or enhance their own space or satellite infrastructure.

UK Space Agency

The UK Space Agency is an executive agency of the Department for Business, Innovation and Skills (BIS) and lies at the heart of UK efforts to exploit and benefit from investment in space technologies and satellite applications. The Agency was created on 1 April 2011, and for the first time integrated UK civil space policy and the majority of programme funding from across Government, the Research Councils and Innovate UK (formerly known as the Technology Strategy Board).

To view profiles of IPSP partners and learn more about satellite applications in emerging markets visit: starhub.sa-catapult.co.uk