The Skys the limit

More than 80 million people tuned in to live coverage of the World Rally Championship in November 2003.

It was the first global live coverage of the event and was made possible with Skylink – a state-of-the-art airborne video relay system for outside broadcasts that uses QinetiQ's phased array antenna technology.

"For many years, the challenge for the World Rally has been to move from recorded to live shows, which is seen as crucial to the event's future popularity", explains Stephen Watson, from S&E's Sensors Technologies Group.

The key technical issue was how to bring multiple on-board camera shots into the live programme.

"We were told in no uncertain terms that it couldn't be done", explains Neil Duncanson, MD of NorthOne, which produced the World Rally event. "But the team proved everybody wrong and core to the solution was QinetiQ's antenna technology."

Pushing the boundaries

Skylink is a partnership between QinetiQ, as the technology provider, and Lions Air, which owns the aircraft. The commercial exploitation of this technology is the brainchild of Stephen Watson, who has been working on smart antennas for nearly ten years.

"I joined DERA in 1995 to look at phased array antennas for radar systems", explains Stephen, Skylink's Product Manager. "The following year, I was speaking with the BBC about how they could make use of this antenna technology in outside broadcasts."

The BBC was interested in new technologies to improve wireless camera systems in outside broadcasts. Specifically, they required an auto-panning antenna that could automatically track RF (Radio Frequency) transmissions for analogue wireless cameras. This task is traditionally performed by a man on the ground directing the receiving antenna to ensure clear, continuous TV pictures.

"Having proven the concept, we agreed a product specification with the BBC and work got under way", says Stephen. "In fact, it was a real culture change for research scientists to develop a product in this way and I have the greatest respect for the project team for their hard work and determination."

Technology trials went well and the antenna was successfully used by the BBC on a live outside broadcast in January 2001. However, the project faced a setback with new developments in digital technology, which meant commercial exploitation had to be shelved.

"New digital wireless cameras were coming onto the market and these did not require the tracking antenna found in analogue systems", says Stephen.

"However, the project was extremely important, enabling us to push forward antenna technology and build our product development skills", he adds.

"I was confident that there was still a market for our antenna technology and in 2001 I got into talks with a Swiss company which was looking to develop a video relay platform for live broadcasts."

The company was working with Lions Air, a Swiss aircraft operator, to develop a new type of video relay platform – a fixed wing aircraft.

Tracking the signals

The traditional approach in live broadcasts is to use motorbikes, fitted with on board cameras, which transmit signals to helicopter relay platforms. They, in turn, relay the video links to a ground receiver located close to the TV production site.

However, helicopters are unable to fly in bad weather and can only operate for two-three hours without refuelling. They also operate at low altitudes, which means that multi-helicopters have to be deployed at geographically dispersed events to pick up signals across a large area, which is costly.

A fixed wing platform could potentially offer wide area coverage but a highly sophisticated antenna is needed to maintain the video link at high altitude. Existing mechanically steered antennas are unsuitable as they can affect the aerodynamics of the plane and can only track one uplink at any one time.

QinetiQ's phased array antenna provides a novel solution that moves the beam electronically and, for the first time, makes fixed wing platforms a feasible option.

The antenna - which uses energy-seeking algorithms as opposed to GPS - can track four camera uplinks simultaneously, providing significant cost savings over a multi-helicopter option.

The airborne platform is a Pilatus PC-12 which can operate in all weather conditions and up to an altitude of 30,000ft. The platform remains airborne for 7.5 hours without refuelling and can take-off and land on short runways, enabling it to be based close to an event.

Three phased array antennas can be fitted onto one PC-12, enabling up to 12 video links to be relayed via one single platform.

European focus

The Skylink operation is based in Zurich which, given its central location, means the technology can be deployed swiftly across

Europe. Importantly, it can be deployed without a QinetiQ operator, helping to reduce operating costs.

Skylink can, when required, also supply video link equipment and full production facilities via two partner companies, Global Link and TV Production Centre Zurich.

The system was officially launched in September 2003 at the International Broadcasting Convention - the leading event of its kind in Europe. The QinetiQ team ran a live demo at the event, attracting interest from the Metropolitan Police, Formula One, BBC and cycling companies among others.

"The level of interest was unusual for a product of this kind", explains Stephen. "The broadcasting industry is a tight community, which limits the rate at which you can take the product to market."

"There is considerable pressure on broadcasters to deliver good quality pictures", he adds. "It's a brave decision for a producer to switch from existing technologies to a brand new concept."

"Despite this, we have covered major events and cemented a good relationship with the BBC."

Already, the BBC has used Skylink for coverage of this year's London Marathon and the Great North Run.

The team has also worked with NorthOne, on the World Rally Championships, RedBull (which televises extreme sports) and TPC Zurich, as a customer as well as a partner.

Stephen and his colleagues are also in talks with Venner TV, a UK production company which is responsible for the Malaysian National Cycling Tour.

"Malaysia has high mountainous terrain and heavy rainfall, which creates particular challenges for broadcasters", he says.

"Last year, three out of the ten live days were lost when the helicopters were grounded due to poor weather. This unreliability has discouraged broadcasters, such as Eurosport, from covering the event which impacts on sponsorship deals."

"Hence, Venner is very interested in our all-weather capability to help provide continuous coverage."

The team is also in talks with the Red Arrows, which is launching a new fleet of aircraft in 2007, about a possible collaboration.

US footprint

Growing the business in the US is also an essential element in the team's strategy.

Skylink was officially launched at the NAB exhibition – which attracts broadcasters and production companies from across the globe - in Las Vegas in April. There, the team met Total RF, a Philadelphia-based company which is responsible for a large proportion of sports coverage in the US, including the PGA Golf Tour, New York Marathon and the Super Bowl.

"A few weeks after the exhibition, the CEO of Total RF travelled to Germany to see Skylink in action at the German Cycling Tour and within weeks we were invited to cover the Life Time Fitness Triathlon in Minneapolis", says Stephen.

Skylink's second system was deployed to the US and the technology performed flawlessly, with the show subsequently broadcast on NBC Sports. Total RF had invited broadcasters, including TV Globo, the fourth largest TV company in the world, to watch the coverage and they were impressed with the results.

"Skylink is snowballing into a global offering much faster than anticipated, which brings its own challenges in terms of maintaining our reputation for excellence", says Stephen.

Skylink also boasts non-broadcast applications and QinetiQ has won a bid, in conjunction with Thales and Boeing, to use the product in a major unmanned aerial vehicles (UAV) programme. There is also interest from the commercial UAV industry for use in tuna shipping to help identify fish distribution patterns.

As for future goals, the team is keen to secure coverage of the three major cycling championship tours – Tour de France, Giro d'Italia and Vuelta a Espana – which provide classic opportunities to showcase Skylink's capabilities.

There are also plans to establish a permanent base in the USA and also for key involvement in the 2008 Olympics in China.

"Ultimately, our aim is for Skylink to become the relay platform of choice for outside broadcasts requiring live links", concludes Stephen.

Which can only be good news for broadcasters and for millions of armchair sports fans across the world.