

Thuraya provides vital communication links for groundbreaking survey of remote cave systems in Kyrgyzstan

Case Study:

Performance of Thuraya satellite broadband and voice communication services in Central Asia

User:

Martin Edström

Products:

Thuraya IP+ broadband terminal

Thuraya XT-PRO satellite phone

Area of Operation:

Kyrgyzstan



About Martin Edström

Martin is a photographer and journalist working with immersive and interactive storytelling in virtual reality. Combining in-depth reporting with new technology, he is committed to telling important stories in new and immersive ways. His clients include media like National Geographic, The Guardian and The New York Times and humanitarian organizations such as UNDP and International Rescue Committee.

Thuraya technology has enabled an geological expedition team to map and survey a previously uncharted area of secluded mountains in Central Asia in a bid to discover new cave systems previously unknown to humankind.

A team equipped with Thuraya satellite phones and broadband was led by the Swedish National Geographic Explorer Martin Edström. They collaborated with experts from Kyrgyzstan's University of Bishkek to locate and map the caves in the south east of the country near the border with China.

"We literally could not have completed this project in the Tian Shan mountains without the help of

Thuraya," says Martin. "The area is so remote there is no cellular coverage and two-way radio only works over short distances due to the mountains and valleys. Our Thuraya satellite equipment and the super-reliable Thuraya network were essential for running the project, keeping our team safe and staying in contact with the team back home."

Uncovering hidden secrets

The Tian Shan mountains are one of the world's last great wildernesses, almost untouched by humans in millennia except for the activities of nomads. The area was closed to the outside world for most of the 20th Century, controlled by the former Soviet Union and treated as a military

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zone. Only in the last 15 years has it been opened up for research, and it remains hard to access even today.

Scientists know there are many undiscovered caves in the mountains, some of which could advance human knowledge. Over the years, cave systems around the world have yielded finds of unique cultural and scientific importance – from the prehistoric art of Lascaux in France to previously unknown bacteria found in Lechuguilla, New Mexico. The caves of Tian Shan could reveal important secrets of their own, but scientists and speleologists (cave experts) have a problem. The region is so large and so remote that finding and mapping caves on foot is painfully slow and expensive. It is so rugged and steep you cannot even drive an all-terrain vehicle in most places.



Which is where Martin and his team came into the picture. After an exploratory visit to the region in 2018, they teamed up with local scientists to develop a process for using advanced technology to locate and map caves more efficiently and much faster. This included using drones to survey wide areas and take high-definition photographs and video of possible cave entrances.

Virtual reality

During the expedition in September 2019, the team became experts at surveying large areas of the rugged terrain and flying drones into the mouths of caves to capture as much information as possible about the interiors. Afterwards they used modelling software to convert the images into 3D projections. These gave scientists a clear idea of the layout of caves so they could decide which to explore in person. Something that looks like a cave opening from afar might be just a hollow shadow,



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making this approach an invaluable time-saver in the field. The projections can be viewed with virtual reality 3D headsets, which enable users to "stand inside" the caves and look around.

Obtaining this level of detail was a game changer. The physical challenge of reaching the caves to explore in person was immense, and sometimes involved rappelling and other climbing techniques. The scientists needed as much information in advance as possible to stay safe and make best use of their time and effort.

The process of using photographs to estimate the physical dimensions of objects is called photogrammetry. It is not new but this application took the project to another level, transforming the speed and efficiency with which scientists could explore the region. Martin estimates

it made the process more than 100 times faster due to the wide area the drones could fly over in just a few minutes and the sheer volume of images they captured – 500 or more for each flight. He says the work is important not only to gather information about the cave systems and geology of Kyrgyzstan but also to hone techniques that can be used on other projects. The combination of advanced surveying and modelling with innovative approaches to storytelling helps to progress knowledge across science, conservation and journalism.

Safety backup and project communications

None of this could have been achieved without Thuraya. Each stage of the expedition required meticulous planning to make the best use of time and keep people safe. The team carried two Thuraya XT-PRO satellite phones,



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enabling anyone working in the field to keep in touch with base camp at all times. Although the mountains were a major barrier to shortwave radio signals, they were not a problem for the satphones because it was easy to find a direct line of sight to the Thuraya satellite in geostationary orbit.

Martin offers an example of how important this was during the expedition. "We identified an interesting cave on the shore of a remote glacial lake. The scientists had to cross the water by raft to reach the cave, which was a journey of about 5 or 6 km. They would not have attempted it without the Thuraya satphones because of the dangers of getting into trouble and being unable to call for help. They also needed to let base camp know when they had arrived and when they

needed picking up on the return journey."

The expedition team carried one Thuraya IP+ broadband terminal, which they kept at base camp as a communications hub. Martin used it to maintain email contact with his office in Sweden about the project and to keep in sync with upcoming assignments. He also used the Thuraya IP+ to send photos and reports of their work in Kyrgyzstan to National Geographic and to post on social media and the team's website.

"We have used Thuraya satphones for several years now and they become an essential part our expedition kit," says Martin. "Thuraya guarantees reliable network coverage and data connectivity even in remote and mountainous areas, with excellent voice quality and battery life."

In total the team mapped about 60 caves, most of which were previously unknown outside the nomad community. The largest was about 100 metres long and contained unique crystals and mineral deposits. Some caves were totally new finds and contained no signs of human habitation, such as bone fragments or ash from ancient fires. This suggests they were never inhabited. "It is an extraordinary feeling standing somewhere that may never before have been entered by a human being," concludes Martin.

Thuraya:

www.thuraya.com

Martin Edström:

www.martinedstrom.com