Mark Rocket, Chief Executive Officer & Company Director, Kea Aerospace

Satellite Evolution Global

Q&A

How perpetual solar HAPS solve big sustainability goals

Kea Aerospace offers a more sensible alternative in perpetual, solar-powered High Altitude Pseudo-Satellite (HAPS) craft. From Christchurch, New Zealand, they support the Oceanic space ecosystem with data gathering and imaging technology, delivering for monitoring and disaster prevention business cases with a sustainable operation. Mark Rocket, Chief Executive Officer & Company Director explained more about the company's disruptive potential.

Laurence Russell, Assistant Editor, Satellite Evolution Group

Question: The current market for satellite imagery and LEO broadband is difficult to enter, due to high barriers to entry, as well as the temporary nature of orbital infrastructure, sometimes only being operable for as little as a year or two. How viable are HAPs technologies in creating a cheaper alternative for Earth observation and pseudo-sat connectivity?

Mark Rocket: HAPs technology will have a tremendously positive effect on the world's future.

We are at a technology convergence point where it is now possible to develop aircraft that can sustain perpetual flight at high altitudes. Flying in the stratosphere, an aircraft is above the winds and weather. Aircraft can be powered by solar energy to fly continuously for many months, in time their missions will last for years.

It's very expensive to develop and launch satellites into space and, since they're orbiting around the Earth at thousands of kilometres per hour, you need a large swarm of small satellites to continually cover the

Southern Alps Stratosphere. Photo courtesy Kea Aerospace

same area. In addition, smaller satellites have a limited payload capacity and can only house smaller, low-resolution cameras.

A solar-powered HAPs aircraft can loiter over the same area and is at least twenty times closer to the ground than satellites, thereby offering a compelling technological advantage.

Question: Could you explain how perpetual solar flight is possible?

Mark Rocket: A large fixed-wing aircraft fitted with solar panels can be charged by solar energy during the day, then the batteries will sustain the aircraft's power during the night cycle.

Some of the key challenges sit around designing an extremely light and durable aircraft; but being able to operate at a much lower air density than we have at ground level, all at a temperature of around -60 degrees Celsius. Combine this with extreme power management and aeroelastic management, and you get an idea of the interesting technology pathway required.

Question: Are high-altitude perpetual-flight solar vehicles the future of HAPs technology?

Mark Rocket: There are two main high-altitude platform options: balloons or aircraft. Balloons may be part of the answer for some HAPs applications, but we believe that aircraft offer the most versatility and best performance to consistently deliver the payload to where it needs to go.

Then it comes down to aircraft flight endurance. Solar power has been the most popular energy source for HAPs technology to date, but there may also be future HAPs aircraft that are powered by hydrogen. A hydrogen-powered aircraft would be able to lift a heavier payload to the stratosphere, though it would have a much more limited flight duration (we'd expect under ten days). A solar-powered aircraft will be able to fly continuously for many months at a time.

Question: In a market plagued with discussions on launch pollution and space debris, are solar-powered HAPs future-proofed for the green industry revolution experts have predicted?

Mark Rocket: It's difficult to find the perfect green technology solution but we believe HAPs do stack up favourably, particularly if each vehicle is deployed for extended periods of time. Launching hardware to space is costly for the environment - rockets use swimming pools of rocket fuel and large components are discarded to burn up in the atmosphere.

Some HAPs may use fuels such as hydrogen, but for many applications there are clear advantages of HAPs being powered by solar energy. This will significantly reduce the cost on the environment if there are fleets of aircraft flying for long durations.

Like electric cars, HAPs technology relies on battery technology which, though not ideal, is getting better year on year. A HAPs aircraft is also designed to be lightweight, so it's integral to the design to reduce the mass of the vehicle which inherently reduces waste.

Solar-powered High Altitude Pseudo-Satellite (HAPS) craft. Photo courtesy Kea Aerospace

Photo courtesy Kea Aerospace

Question: With a scientific consensus that natural disasters are getting worse and more frequent, are affordable imaging devices like Kea Atmos the perfect answer for creating early warning systems for the ecological disasters to come?

Mark Rocket: You can't solve the problem if you can't see it. When there are natural disasters such as earthquakes, tsunamis, volcanoes, wildfires, and floods, then people need to quickly see what's going on and be able to respond swiftly.

We are experiencing widespread ecological changes on a global scale, and we believe that HAPs will have an important role to play in future risk mitigation, as well as helping to establish swifter reaction times to deploy resources to where they need to go.

Question: Innovations like yours are just one of the insights offered by the New Zealand space industry, and the greater Asiatic talent base at large. Should the Western world be paying more attention to the Eastern one?

Mark Rocket: There are HAPs development projects underway in New Zealand, Australia, and South Korea, as well as a range of other locations in North America, Asia, and Europe. We expect to see more people around the world paying closer attention to HAPs technology in the near future as these projects get closer to commercialisation.

Solar-powered HAPs technology will progress rapidly this decade and there will soon be widespread awareness of the benefits that stratospheric platforms can bring to a wide range of applications.

Question: What future applications do you see perpetual solar flight technology satisfying in the net-zero world governments are scrambling to implement?

Mark Rocket: At Kea Aerospace, we see environmental monitoring as a key application, and we're excited about making contributions in this area. Governments and organisations are wanting to see the full data picture to detect changes that are taking place over their land and waterways. There are data gaps for aerial imagery in other applications such as precision agriculture, forestry, smart cities, disaster management, and maritime domain awareness.

Currently, the main method by which people can access high-resolution aerial imagery is from manned aircraft, but these are expensive to run and have infrequent coverage over broad areas. Swarms of satellites will be able to achieve coverage over wide areas, but they orbit too high to get the quality resolution required for many applications. We are developing game-changing HAPs technology to regularly acquire aerial imagery over vast areas at a superior quality – and we'll do this much more regularly and more cost-effectively than has ever been achieved before.

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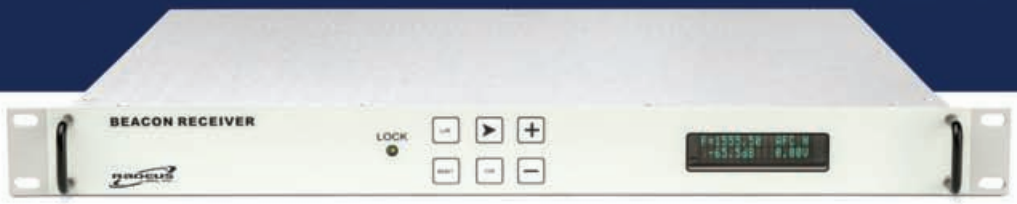

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