



Photo courtesy of Isotropic ●●●

Isotropic Systems is developing the world's first multi-service, high-bandwidth, low power, fully integrated high throughput terminal designed to support the satellite industry to 'reach beyond' traditional markets and acquire new customers with a full suite of high throughput services. The company's team of industry experts and scientists has pioneered several firsts in satellite terminal design.

## Today: Ground satellite terminals. Tomorrow: The World

Isotropic Systems was founded to deliver innovation to the ground terminal space segment with next-generation technology based on scientific advances in the field of optics. With their unique design, terminal costs are expected to be a fraction of those available on the market today, making the technology a key enabler for bridging the digital divide and accessing greater satellite market share by closing the most challenging business cases. Amy Saunders met with John Finney, Founder of Isotropic, to discuss the company's vision for success.

### Question: What can you tell us about Isotropic's vision?

**John Finney:** Our vision is to create a new generation of satellite terminals – the word is terminal, not antenna i.e. a fully-integrated, out-of-the-box experience which includes the antenna functionality, distributed power, integrated modem bays to accommodate different modems from different vendors, etc. The reason we prioritised our development activity on a fully-integrated terminal rather than a flat panel antenna is because the price disruption that we plan to offer will be so significant, both in Ku and Ka-bands, that we will enable high throughput satellite (HTS) operators, whether they

be in GEO, MEO or LEO, to reach beyond into new markets and access customers for the first time.

An example of those new markets is consumer broadband; we're working with OneWeb to help them to develop the terminals for their consumer broadband network. Cellular backhaul, enterprise-class broadband and mobility solutions are other areas. We're also working with SES for its mPOWER network, and Inmarsat for its Global Xpress network. In each case, we're assisting operators to fill their new and future satellite capacity, which is many times greater than what's available on the market today.

The way that we enable them to do that is to offer them a substantial increase in functionality or a substantial decrease in price.

### Question: How will Isotropic's disruptive optical technology deliver a revolutionary shift in the satellite communications industry?

**John Finney:** There are effectively two options today for antennas.

You can have a parabolic antenna, which is very spectrally efficient, in that there are very few losses to the signal once you start processing it. However, if you want a parabolic dish to scan, you have to install it on a stabilized mechanical platform to keep it pointed and looking straight towards the satellite. While you might maintain your radio efficiency, you're effectively



John Finney, Founder of Isotropic ●●●

applying brute force to maintain that scanning capability. You have to add tens or hundreds of thousands of dollars of tracking capability to create that scanning performance.

Conversely, if you want to do it electronically, with today's technology you'd be looking at phased array or electronically scanned antennas. Those two classes of terminals also apply brute force; in order to create an electronically-scanned solution, a significant amount of circuitry and therefore cost is put into the design in order to create only one single beam in a given direction.

What we're doing is pioneering a new way to avoid this brute force approach and instead use a quantified way to scan all the way across the horizon, without compromising radio performance when compared to phased arrays, but using substantially less circuitry and electronics, to achieve a much lower cost point. With this, we plan to create a strong value proposition for customers.

We have designed, tested and validated a range of optical beam-forming devices, which gives us complete control over the pointing and re-point of radio signals. We have the capability to design very sophisticated terminals that allow the optics to do 80 percent of the scanning work, at the performance of phased array or better. As a result of our passive beam-forming, we use 80 percent less active beam-forming circuitry than you get with legacy phased array technology. We end up with a terminal design where you get almost unlimited instantaneous bandwidth, multiple links within the same terminal, a fully integrated terminal experience, a 90 percent reduction in power consumption and all at low price in a small, compact form factor.

The architecture of our terminal design accommodates typically two universal modem bays. By universal, we mean that any certified modem vendor with a card which can interface with our antenna technology. Once we have a

relationship with a vendor and they're certified, any of our customers can simply order that card, place it in the universal modem bay, put the modem bay into the terminal, and what they get is a fully integrated link. If the customer wants a second link from the same terminal without paying all over again, they're able to just add another card, either from the same modem vendor or another. Additionally, if the customer wants to utilise their existing modem infrastructure, we have an external interface on the antenna to accommodate this.

**Question: March 2018 saw Isotropic announce a new range of partnerships and deals, particularly with modem providers. What can you tell us about these arrangements?**

**John Finney:** Our objective is to have a number of modem partners that offer these modem cards that can be integrated into our terminals. The first partner that we started to work with formally was iDirect; that company is



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developing a lot of capabilities to interface with multiple operators in different orbits, and ultimately at different frequencies at the same time. They have a very clear roadmap to move from integrated modem devices to modems on a card, and ultimately to modems on a chip.

Most of the modem manufacturers seem to be moving away from the hardware business, and they're recognising that the technology that's out there will enable waveforms, what we typically refer to as modems, to be integrated onto a chip. Once you can get onto the chip, it's very easy to integrate modems directly into our terminals. We're a few steps away from that yet. We're first doing things in the form of a card, but eventually we see modems effectively being a piece of software, mounted on a chip, and integrated into a terminal. In the long term, I don't think we'll have a universal modem bay at all, it'll just be a waveform hosted on a chip.

We're working with iDirect now to close out on the final integration work required to enable us to accommodate their modems. We can then work towards the iDirect customers, our satellite operator customers, and their customers, to show them this fantastic capability. Our technology means that, for example, if you're an Inmarsat channel partner, you could put one or two iDirect modems in our terminal to support your links, you can do your line-up, staging, testing and configuration, and before it even leaves the



Fully integrated plug-and-play terminal option. Photo courtesy of Isotropic ●●●

warehouse, you can be absolutely certain that the terminal is ready to find the satellite, link, and pass traffic almost as soon as it's powered up. Very little intervention or installation is required on the vehicle – almost anyone can install it, because all the hard work has been completed before the terminal is shipped.

**Question: What can you tell us about your recent deal with OneWeb, and plans to bridge the digital divide?**

**John Finney:** OneWeb's business model includes consumer broadband, and given the size of the system they're building, the current market size does not fill a system with so much capacity. They have their eye on the 3.5 billion

people in the world who are still completely unconnected to the Internet. Of that 3.5 billion, 75 percent come from emerging markets, spanning just 20 countries.

To deliver consumer broadband to the majority of that 3.5 billion, you need a terminal solution that, while highly sophisticated in its ability to track satellites that move very fast across the sky, must also be available at a price point that those consumers can afford, especially since we're connecting them for the very first time.

That relies on SoftBank and OneWeb having a technical solution for consumer broadband that is priced in the very low hundreds of dollars per terminal.

We are not aware of any other vendor that has a strong claim on how to actually accomplish that. We, ourselves, have a very clear view that it can be achieved using our technology, and we're actively developing that terminal for OneWeb who are working with several innovative terminal vendors to achieve this objective. It's a race to see who can do it best!

**Question: What are your plans for commercialization?**

**John Finney:** Our roadmap prioritizes the customers that we've signed with that are helping us accelerate our technology. We'll serve them first, because they're making a financial contribution to accelerate the technology to market, and they've invested a lot of time and effort with us.



Multi-beam terminals can maintain high-speed connectivity along long passenger rail routes through remote locations ●●●



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The fact is, we're working with the biggest satellite companies in the world, Inmarsat, SES and OneWeb, as well as important regional operators such as Avanti, so they'll get the first qualification units that meet their particular service requirements, late 2019. They'll receive a limited beta release product to work with and share with their channel partners by the first half of 2020. They'll

also have the first production runs from our manufacturing plant in the second half of 2020.

We're already generating a fixed, firm backlog for our terminals. On the last day of Satellite 2018, we announced a deal with Neda in Afghanistan for 2,000 self-installing terminals. I envisage that we'll have a backlog of 50,000-100,000 terminals

before we start shipping our mass-produced terminals in 2020.

For production, we don't intend to manage our own manufacturing line; we view this going through a fairly traditional contract manufacturing route. The optical elements of our design will be manufactured more than likely in a separate location to the electronics, and the two will be integrated together before they're shipped to customers.

**Question: It's been a good year so far for Isotropic. What's on the horizon for the rest of 2018?**

**John Finney:** Execution, Execution, Execution! We have important technical milestones coming up and we are making continuous progress with our major customers.

We are now starting to enter the early stages of preparing for manufacturing readiness and of course funding, and will complete an A-round later this year that will support our continued development through 2019 and early 2020.

We have had significant interest in

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supporting Isotropic at a strategic investor level since the company launch at Satellite 2018.

**Question: The NewSpace market is booming with both investment and innovation right now. What does NewSpace mean to you, and where is Isotropic's place within the market?**

**John Finney:** I characterise NewSpace into four corners of innovation:

**DELIVERY** - So we're talking about reusable launch vehicles, electric propulsion significantly lowering the costs of deploying space assets. We all see the track that's on right now, and the phenomenal results they're reporting.

**CAPACITY** – The delivery of spot

beams for very large and very powerful satellites in GEO or NGSO are the effective enablement of frequency reuse by the combination of spot beams, or the reassignment of capacity as the satellites move around the Earth. That's really lowering the cost per bit and adding enormous amounts of capacity into the industry. After O3b, which I think is a phenomenal success in terms of proving constellations can be profitable and can create value for themselves, the ball has been set rolling for lots of other new systems.

**EFFICIENCY** – The modem vendors, in particular, who are figuring out really innovative ways to take all the additional capacity that has come along, and then take it much further to really drive efficiency.

The final corner of innovation, and the most critical right now since it is poorly addressed by the current ecosystem, is **DISTRIBUTION** – To me, that means the whole enchilada, not antenna's or HPAs or BUCs and let's not forget modems. No, we mean closing the business case at the level of fully integrated terminals, not antennas. We are going to change the economics of terminals dramatically, that is the mission we are on in order to help our customers flourish and 'reach beyond' into new markets addressing new customers; that's how to fill HTS satellites.

Our range of terminals will create mass markets that will enable us to fill those big satellite networks in the first place. I'm talking less about superyachts, and more about fishing vessels. Or coaches and buses in emerging markets, where there are millions of those vehicles but there's very limited coverage as those people go about their journeys. They're really crying out for a service provider model.

The terminal economics must be radically different to what we're seeing with today's flat panel or phased array antennas. There's an enormous gap here, one so large that it actually puts at risk the viability of these NewSpace systems. If we can't distribute the capacity by offering the right terminal economics to these customers, we won't be able to grow the satellite industry. Then, we'd end up in an unfortunate situation where there's more capacity available than there is demand.

We're on a real mission here, and we believe that coming into the market with hugely disruptive pricing will allow those satellite operators to finally reach those markets. We think we can reduce terminal pricing by 75-80 percent, depending on the application. These satellite operators haven't invested billions of dollars into their systems without recognising, for example, the huge market for consumer broadband, the enormous market for the connected car or ship, demand from low-cost airlines or mobile operators hungry to connect thousands of towers with high capacity services right at the edge of the network and in most remote places. Just like our customers, Inmarsat, SES Networks, OneWeb and Avanti, we don't fear the change, we embrace it!



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