

Turning space junk into cash

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While the occasional (albeit quite rare) in-orbit failure, and more recently a collision have taken communications satellites out of service, more typically they have tended to die with a whimper, rather than a bang. This is because most satellite communications networks are designed for use with Clarke orbits, the specialized 24 hour orbits that make satellites appear to hang motionless over fixed locations on the equator. (Of course, in actuality they are moving so as to cancel out the Earth's rotation.) In turn, these orbits permit ground user that may number in the hundreds of thousands to benefit from having simple antennas that you aim at the satellite, bolt it in place and can conveniently forget about.

The problem is that orbits of this type are inherently unstable over the medium to long term (i.e. months to years). To correct for this instability, satellites in these orbits periodically must adjust the orbit by firing small rocket motors that over time consume a great deal of fuel. Once this fuel is exhausted, the satellite can no longer maintain its orbit and it must be retired, *even if it is otherwise fully functional.*

Therein lies the opportunity we cited in the title of this article.

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As the satellites begin to drift, they do so in an entirely predictable fashion, called an inclined orbit. For users with antennas that can compute the location and track the satellite as it moves across the sky, it remains a useful asset, capable of carrying communications traffic. While this has been true as long as satellites have been used, the complexity and cost of these antennas and associated computing power has precluded widespread use of inclined orbit satellites. But this is beginning to change.

With today's much smaller (as small as 60 cm) Ku and Ka band antennas, cheaper processing power and demand (much of it military) for mobile connectivity that is driving substantial antenna production runs, the cost of mobile high gain tracking antennas has fallen dramatically, and it continues to fall. Companies like Mobilesat, KVH, Raysat, S3Satcom, C2Sat and many others now offer Ku band connectivity that is portable enough for Humvees and pleasure craft as well as shipping vessels and cruise liners. (A

typical antenna is shown below – the radome is 26” in diameter, encloses a tracking antenna and the entire unit is 60 lbs.)



Source: KVH Industries

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In turn, with a large and growing number of these mobile tracking terminals in service for both military and civilian applications, an increasing number of end users no longer need stationary satellites – and thus can use capacity from satellites in inclined orbits. And, since there is effectively an inexhaustible (thanks to continuing fleet replacement) supply of “free” satellites that support this traffic, this growing addressable market is thus giving satellite operators a means to “turn space junk into cash”, using their low cost of providing service (no satellite capex!) to offer mobile users cheaper capacity to boot. We believe this is a win-win for all that over time could provide a meaningful lift to satellite operators while speeding the adoption of mobile broadband services.



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