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BVLOS UAV and Satellite Communications

In recent years the adoption of Unmanned Aerial Vehicles ("UAVs") also known as drones has been growing at an exponential rate. From its origin for classified and secretive military projects during the Second World War, UAVs are now deep into many commercial, scientific and civilian industries for every conceivable application, be it for the recreational or entertainment activities such as the hobbyist drones and film making, or other more weighty and hazardous missions that will not be easily accomplished without the sheer advantage of remotely piloting the UAVs to provide aerial coverage for surveying, surveillance, and conveying operations. The advancement in the edge-processing technologies for data analytic and Artificial Intelligence applications is set to accelerate the adoption of UAVs to a new height.

One of the critical enabling technologies for UAVs is none other than the wireless communications. Drones of recreational or filming purposes usually resort to short-range RF technologies most commonly found in the unlicensed band such as 2.4GHz. The advent of 5G should provide the bandwidth and capacity necessary to support harmonised communications among the autonomous drone operations, which are destined to increase in numbers in the city and suburban areas.

However, for the technological benefits of UAVs to be fully realised, one has to look at many untapped business opportunities made possible by the UAVs with capabilities to travel over 100Km or farther. Such intermediate range or long range UAVs, which will definitely be operating beyond visual line of sight ("BVLOS") of a monitoring centre, will have to require very different wireless communications techniques which must not only cover long distance but also to be extremely reliable. Any terrestrial communication operator will find it uneconomical to invest in infrastructure to cover long distance and wide landscape where the usage efficiency will pale in comparison to those in heavily inhabited areas. This is where the satellite communications industry finds its relevance to intermediate and long range BVLOS UAV applications.

By definition a satellite communication system consists of one or more satellites capable of relaying radio waves between two faraway points on or near the surface of Earth through a network of complementing Earth stations. Because of the high altitude of these operating satellites, the footprint covered by a satellite communication system easily stretches over thousands of kilometres over land and seas. This makes satellite

communications indispensable for long range communications over land and across the oceans.

As a technology company that has a long heritage in developing digital satellite communication terminals for a vast variety of mobile applications on land, at sea, in sky and in space, Addvalue believes the opportunities are ripe for a low cost satellite communication terminal specifically designed to support communication needs of BVLOS UAVs. There are emerging commercial companies providing "Drone as a Service", offering long range asset inspection and monitoring solutions. For such UAVs in weight class between 25kg and 50kg, the full duplex and IP based communication terminal including the antenna can be designed to be an embedded part of the UAV, thereby greatly optimising the SWaP-C: Size, Weight, Power and Cost requirement of the UAV. For a data rate of 200kb/s to 300kb/s in both directions, all of the essential telemetry command and control will be supported. With on board edge-computing that some of these UAVs are equipped to perform, these data rates are more than capable of transmitting processed data that are immediately actionable upon receiving on ground, thereby vastly improving the operational efficiency and latency which can be vital in a mission critical scenario.

The BVLOS UAV is currently facing some hesitancy and resistance from regulators around the world, just like many novel technologies that require careful regulatory frameworks to be in place for public safety and security reasons. Despite the challenges, a lot of efforts are put in to push the progress in this aspect. For example, in order to lay the foundation towards a unified traffic management system for UAVs in the entire US airspace, FAA issued a notice of proposal for a remote ID system for UAVs at the end of 2019. Such an ID system will enable each UAV to identify itself to a remote observer for safety purposes.

Indeed, UAVs equipped with an on-board detection and avoidance system have been well demonstrated to operate autonomously with missions accomplished in a real environment without any mishap. Trials on such safety measures or others are being conducted globally. Once the regulatory framework is in place, a much bigger boom can be anticipated in the UAV applications that will lead to many game-changing impacts across numerous industries.

In this vein, Addvalue is eager to partner with like-minded industrial players in the UAV industry with its satellite communication knowhow and embedded hardware system design capabilities to get ready the communication solutions to support the BVLOS UAV operations.