5E2 Research Ethics Report

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My project focuses on the inter-communication of small satellites, namely CubeSats, in low earth orbit. Missions which launch multiple CubeSats may benefit greatly from the inter-communication of satellites. The project focuses on simulating communication protocols which may be used by CubeSats networks (CSNs) and does not deal with laboratory work or the collection of personal information. As such, this report focuses on a hypothetical research scenario relating to a particular application of CSNs.

CSNs have numerous applications which create ethical issues such as military communications, control of high-altitude drones, naval and aerospace vehicle tracking, and so on. This report focuses on an area which raise less obvious ethical issues, that of scientific earth observation (EO). The chosen hypothetical research scenario seeks to examine two areas: how CSN's may coordinate in order collaboratively observe ground locations and how these observations may be used to construct detailed three dimensional maps of observed locations. CubeSats are well suited for small scale EO applications [1] thanks largely to their low cost of development and launch. Such low cast EO can provide considerable benefits, especially in the areas climate and environmental science [2]. It is clear that CSNs will greatly increase the EO capability of CubeSat missions by introducing collaborative sensing [3]. Research which seeks to extend and enable CSN EO faces ethical issues relating to data sovereignty, data protection and espionage.

As EO techniques improve many significant space policy organizations, such as the UN Office for Outer Space Affairs, have flagged potential ethic and legal issues [4,

5]. Specially, one can consider a common ethically and legally questionable case in EO observation. An American mission which uses a CSN to perform EO may be launched from the International Space Station. On their polar orbit the CSN collaboratively monitors Arctic and Antarctic ice formation. Their orbit also leads the CSN over London, Barcelona and Cape Town. At present there are few legal structures and effectively no preventative measures in place to stop the CSN from collecting detailed information relating to these locations [6]. Presently it would be impossible for a third party in one of this location to determine what, if any, data was being collected by the mission. This is a common issue with EO, very often, when a mission collects data of an area in another sovereign nation the data is property of the nation originating the mission and not the national, person or organization to which the land belongs.

Performing research in the area of CSN EO requires a careful consideration. Data collection and data analysis both contribute to ethical issues in this area. Whether the utility of low cost high fidelity EO mitigates the duty of the researcher to prevent the malicious use of their work is an open question. In order to address future ethical issues research may be conducted into insuring transparent sensing operations and sensing in areas of the spectrum which cannot reveal sensitive data.

At present, it is clear that international space policy and law must advance in order to insure that EO can be performed without causing a rise in international tensions. It is likely that issues relating to data protection and sovereignty in other fields will inform the correct approach to the advancement of EO technology. This will be particularly important as academic, commercial and defence organization move towards larger and more capable EO using CubeSats [7-9].

References

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