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CO_2Explorer: Conducting Greenhouse-Gas Measurements of Landfills using a Small Fixed-wing UAV

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Quantifying inventories of Greenhouse gas emissions, primarily Methane and Carbon Dioxide, from distributed sources such as a landfill has historically been undertaken using one of several ground based measurement techniques. These methods are either time and/or resource intensive. As a result regulatory agencies have started looking at the potential of using small-unmanned aircraft to supplement or supplant the current methods. The challenge of using a UAV to perform these tasks is the trade-off between accuracy, operational flexibility and operational productivity. This is driven by the state-of-the-art in measurement instruments, the operating environment at landfills and the regulatory/safety environment surrounding UAV operations.

This work describes the development of the operational concept, and associated UAV measurement platform for the CO_2Explorer. It looks at the scientific, engineering and possible policy trades and compares the use of small rotary and fixed-wing UAVs from both an operational and measurement perspective. This work also makes recommendations on system development and operation for users lacking in both systems engineering and operational experience.