

AIRSTART



AIRSTART – Optical communications for UAVs

Accelerated Integration of Reliable Small uav systems Through Applied Research & Testing

Aerospace Technology Institute/Innovate UK

Yoann Thueux & Gavin Erry

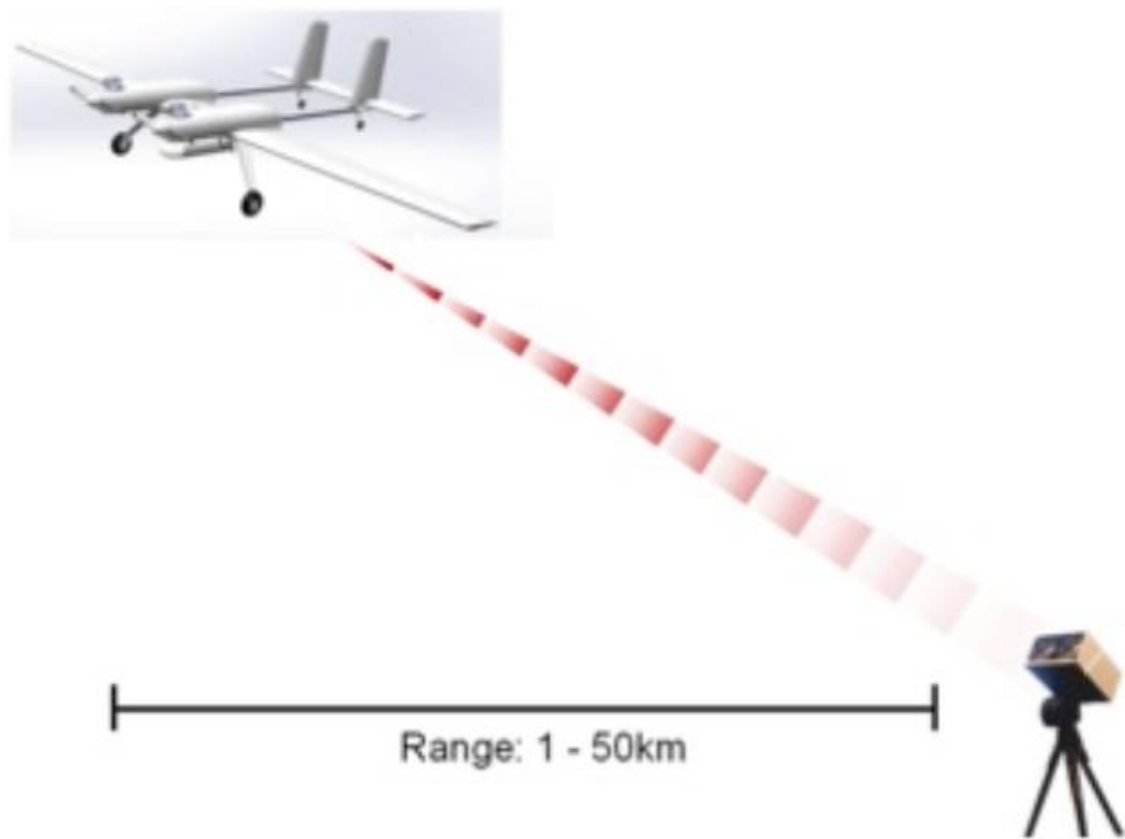
The problem

- UAV operators require more and more bandwidth for real-time data transfers
- Beyond Visual Line of Sight (BVLoS*) are required to enable the UAV market to expand
- The Radio Frequency (RF) spectrum is over-allocated
- RF technologies do not allow high-datarate communications
- Safe BVLoS operation require knowing the exact position of the UAV



Goals

- Establish a UAV laser data link of 100+ Mbps over a range up to 50km
- Demonstrate precision laser beam steering from a UAV
- The laser terminal needs to be compact and lightweight (under 4Kg)
- The coarse pointing error will need to be measured very accurately
- The fine pointing will require precise and accurate navigation data
- The laser system will need to be eye safe (1550nm)



Spotter UAV

- Twin-engine UAV
- Developed at the University of Southampton
- Mostly built out of 3D printed components
- Capable of radio controlled and autonomous flight
- 5-kilogram payload
- Up to 5-hour mission time (payload dependent)

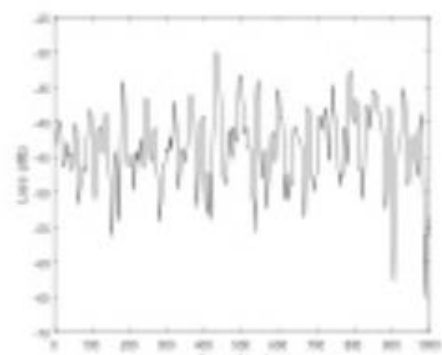
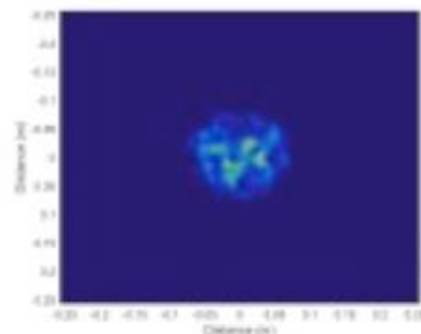
SPOTTER*

UNIVERSITY OF
Southampton



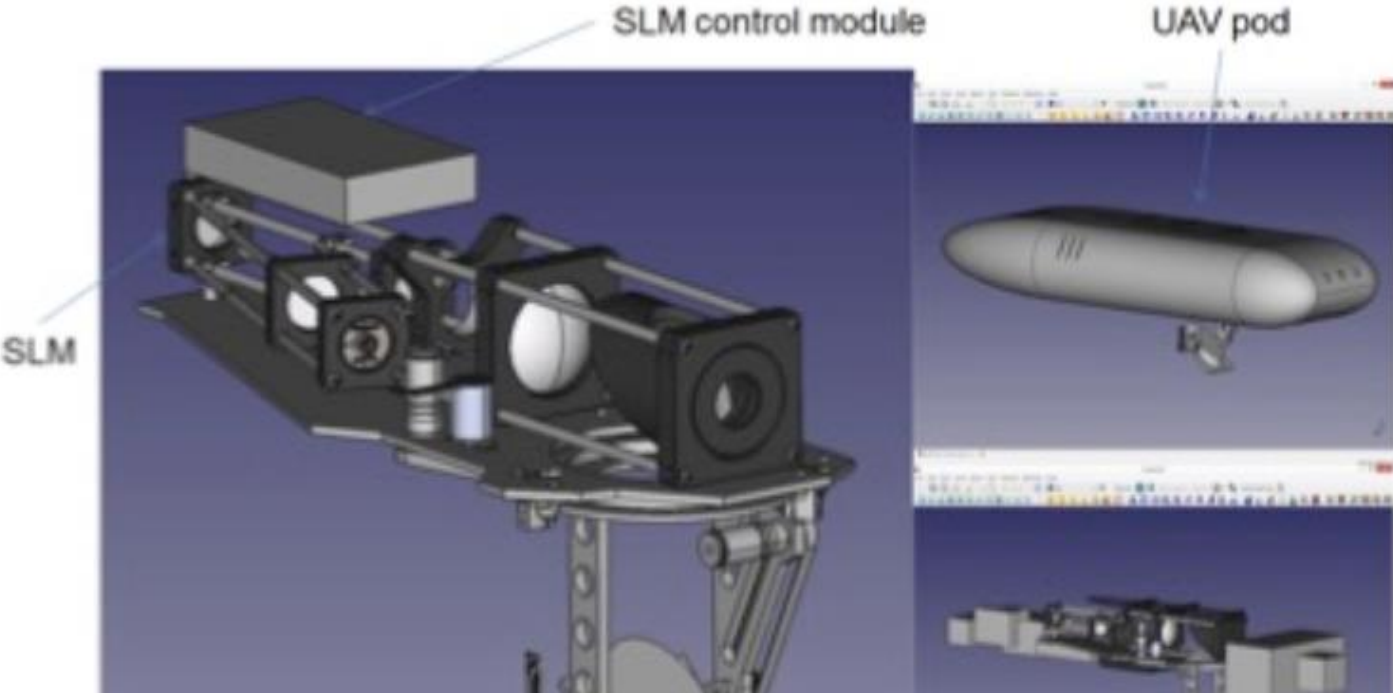
Our solution

- A laser communication system usually comprises of a coarse and a fine laser pointing system
- Our solution will employ lightweight materials for the coarse mechanical pointing stage and a lightweight, solid state, Spatial Light Modulator (SLM) for the fine pointing
- An in-line lithium niobate modulator (supplied by Gooch and Housego) will be used to modulate the laser beam with UAV mission data. The system will be capable to transmit data at data rates up to 5Gbps
- However this will be limited by pointing errors and atmospheric conditions



Our solution (2)

- To keep weight down, the mechanical assemblies will be 3D printed or cut from carbon fibre plates using a precision water jet cutter
- A precision navigation system will be used to inform the laser pointing algorithms
- The laser terminal will be integrated into a pod (supplied by AV Optics) carried by the Spotter UAV



Benefits

- Once matured, this system will address two key requirements of the UAV community : high-datarate communications and laser positioning for safer BVLOS operations
- If adopted, this solution will generate new revenue
- This system will prove SLM technology can be flown and will start paving the way for use of such technology on other platforms such as small satellites (e.g. CubeSat)

