

A New Aircraft-Towed Platform for Air-Sea Interaction Measurements

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A Controlled Towed Vehicle (CTV) capable of controlled flight as low as the canonical reference height of 10 m above the ocean has been instrumented for air-sea interaction research. The CTV uses existing towed drone technology for maintaining a user-set height above the sea via a radar altimeter and controllable wing. After take-off, the drone is released from the tow aircraft on a ~700m steel cable. We have instrumented the 0.23 m diameter and 2.13 m long drone with high fidelity instruments to measure the means and turbulent fluctuations of 3-D wind vector, temperature, humidity, pressure, CO₂ and IR sea surface temperature. Data are recorded internally at 40 Hz and simultaneously transmitted to the tow aircraft via dedicated wireless Ethernet link. The CTV accommodates 40 kg of instrument payload and provides it with 250 W of continuous power through a ram air propeller-driven generator. We will discuss the development of this new platform and the engineering challenges and solutions that have been implemented. We report results from flights over the coastal ocean where fluxes and profiles from the CTV and the CIRPAS Twin tow aircraft at 30m (before release of the drone) are compared.

Operational problems attributed to sea salt contamination in low-flying hurricane research aircraft engines will most likely limit low-level boundary-layer flights. UAS (Unmanned Aerial Systems) and dropsondes are alternates for measurements near the ocean surface. Dropsondes have limited sensor capability and do not measure fluxes, and most present UAS vehicles do not have the payload and power capacity or the low-flying ability in high winds over the oceans. The CTV therefore, fills a needed gap between the dropsondes, in situ aircraft, and UAS. The payload, capacity and power of the CTV makes it suitable for a variety of atmospheric research measurements. Other sensors to measure aerosol, chemistry, radiation, etc., could be readily accommodated in the CTV.

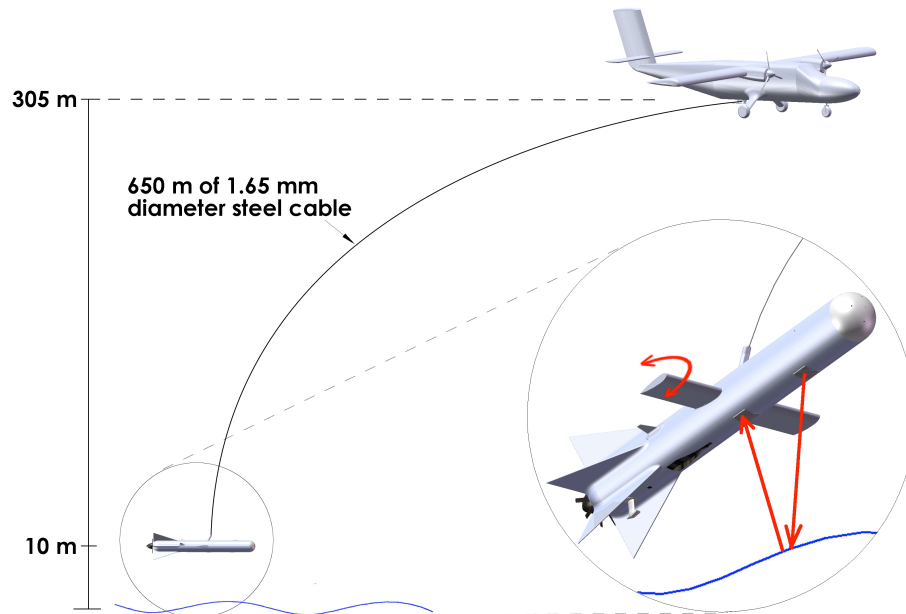


Figure 1: Concept of the Controlled Towed Vehicle with radar height keeping control system.