EUREC⁴A-ATOMIC

Airborne based remote sensing operations that may influence surface operations
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The **ATR-42**, **HALO** and **WP-3** aircraft employ different active remote sensing instrumentation and the **HALO** and **WP-3** deploy dropsondes, the **WP-3** also will deploy AXBTs (Airborne Expendable Bathythermographs). The **BORÉAL** and **Twin-Otter** only have passive or in situ sensors, barring a crash, they pose no hazards to surface instruments or observers.

Radars on the aircraft in the microwave part of the spectrum, with downward oriented W-band systems on the **ATR-42** and **WP-3**, and a Ka-band (35 Ghz) system on **HALO**. The **WP-3** also operates a Ku (24 GHz) wave radar and a conically scanning X-band tail radar. For the **ATR-42**, the RASTA W-band radar changes its scan sequence to avoid illuminating the surface (and ships) during possible over-flights. A second W-band system (BASTA) is only horizontally staring and thus does not pose an issue. Even in the case of accidental illumination all radars are operated so that a downward signal reflecting off a hard target would not damage the system. Assuming a perfect reflector and a halving of the distance, as would be experienced by a surface receiver, this implies an incoming signal for a surface system that is 3dB larger, which we expect would not damage surface upward staring systems even in the case of accidental illumination.

Lidars: HALO operates a water vapor dial system operating at four wave-lengths clustered near 935 nm, with additional lidar signals at 1064 nm and 532 nm. It is operated so that it is eye safe passing over a ground-based observer. It is not inconceivable that these signals could cause damage to versa sensitive surface based optical systems working at the same frequencies. **ATR-42** operates an eye safe UV backscatter lidar, but this is sideways looking and thus also poses no hazard for sensitive upward looking optical systems.

Dropsondes: These are Vaisala parachute borne sondes and will be launched by HALO and the WP-3. Near the surface they have fall speeds of 5-7 m/s and a mass of 350g. They are not anticipated to pose hazards for shipborne operations and will be only launched away from shore.

AXBTs: These are only launched from the **WP-3** at low altitudes over the ocean only when surface vessels are not present. Generally they will be launched far upwind in the trade-wind alley away from all research ship activity, except perhaps from the R/V Ronald H. Brown. They are larger (91 cm) and heavier (6.4 kg) and would pose a hazard for surface objects if one were to be present.