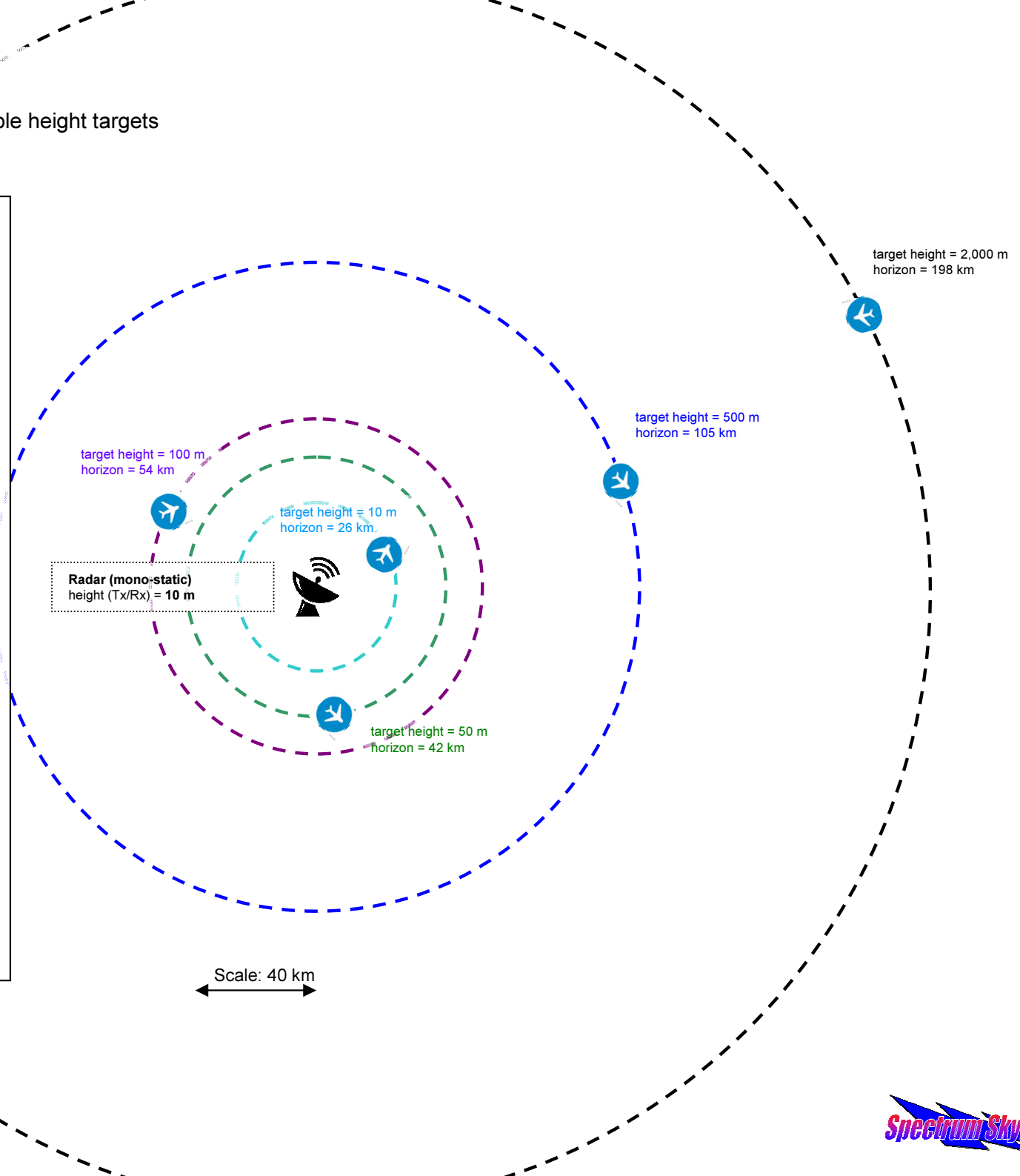
Radar: Basics – scenario 1a

Radar Horizon: fixed height radar, variable height targets

Radar Horizon

- The curvature of the Earth will block the radio signals at a distance dependent on; the height of the radar Tx and Rx antennas, and the height of the target.
- The radar horizon for line-of-sight (typically VHF/UHF) systems is fixed, irrespective of the size or reflectivity of the target, the power or gain of the radar, or the frequency and wavelengths. Over the horizon propagation is only possible for low-frequency (LF < 3MHz) surface wave propagation and high-frequency (3MHz < HF < 30MHz) ionospheric propagation.
- Radar horizons are shown for a mono-static radar with co-located Tx and Rx antennas at the same fixed height, and different target heights.
- Varying the target height is mainly relevant to the aviation scenario with aircraft targets.
- For higher altitude aircraft where the radar horizon is very far, the limiting factor will be ability of the radar to detect the target with it's Tx power and antenna gains, rather than the horizon.
- A land scenario may have targets elevated above the average height due to terrain such as hills and ridges, but then there will also be complications with radar returns from these terrain elevations ('clutter').
- A maritime scenario could consider targets above sea level for large ships where the 'centre' of the radar target may be some metres above the waterline.
- For a bi-static radar, with separate Tx and Rx antennas that may have different locations and heights, the Tx and Rx will have their own separate horizons for targets at a given height.



Radar: Basics – scenario 1b

Radar Horizon: variable height radar, targets near ground or sea level

Radar Horizon

• For land and maritime scenarios where the targets are near ground or sea level, and the radars are often mounted on vehicles or ships themselves, the height of the Tx/Rx antennas are critical in extending the horizon.

• Radar horizons are shown for a mono-static radar with co-located Tx and Rx antennas with varying heights, and the same target height of 5 metres, representing the centre of a ship.

• As towers to house radar antennas can only be a few tens of metres high, if they are to be portable, locating the radar on an airborne platform is necessary to extend the horizon further. However this has disadvantages as there will be larger returns ('clutter') from the ground or sea surrounding the target, due to the lower aspect angle.