Airborne or spaceborne radar is admirably suited for the production of high-resolution images of large stationary features on the ground. But if the purpose is to detect small objects on or close to the ground, then the principal problem facing a radar is the large amount of energy reflected back to it from the sea, from the ground, or from ice, snow or vegetation covering the ground. Unless special steps are taken to process the signals, the "clutter" will obscure the much smaller echoes from the targets of interest. Most of the transmitted energy that strikes a horizontal surface at a glancing angle is reflected outwards and upwards, with little returning back in the direction of the radar. Consequently, while clutter is usually so severe as to mask all targets directly or nearly below the radar, it will be less serious in directions far from the vertical. Figure 4 shows two cones beneath satellites at three altitudes, representing a glancing angle of 3° and 50° with respect to the horizontal at the point of reflection. Clutter normally renders radar detection impossible in the central "nadir" hole inside the inner cone beneath the satellite.[26]

This constraint on detection directly beneath the elevated radar does not apply to visual or infrared surveillance. However, the limitation represented by the outer cone, due to scattering and absorption of electromagnetic radiation in the lower atmosphere, is experienced by radar as well as by electro-optical sensors.

Detection of Colour, Heat, and Movement

An object under surveillance can be detected and identified only if it is in some way distinguishable from the background in its immediate vicinity. To the eye, it may look different because of its shape or colour, perhaps drawing attention because of movement. Colour is determined by the wavelengths of visible light reflected from the objects. The shortest (violet) and the longest (red) of the visible wavelengths differ by a factor less than two.

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[26] G.N. Toandoulas, "Space-Based Radar," *Science*, Volume 237, 17 July 1987, p. 258.