

# Missile coverage analysis

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## Missile coverage analysis

Based on the specification for the GFE the sensor range diagram of Figure 1 may be created.

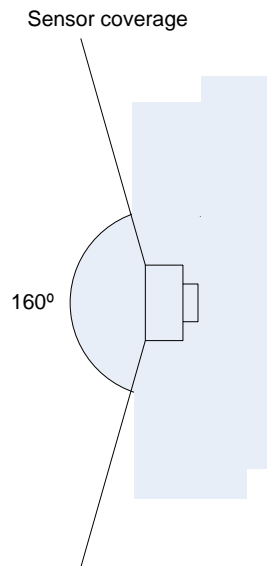
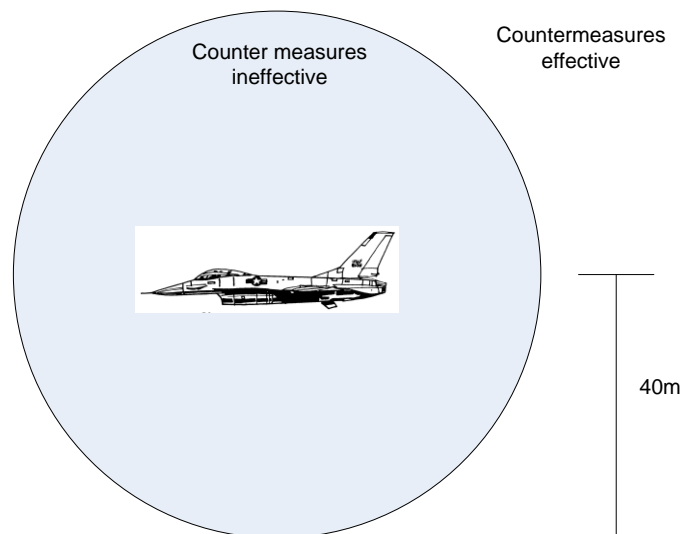


Figure 1: Sensor coverage diagram

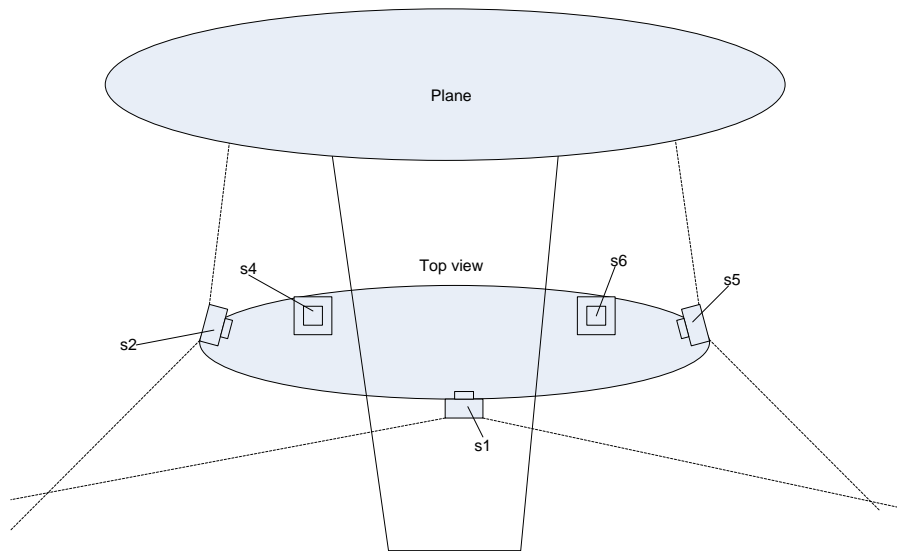
Based on the F-16 speed and manoeuvring capabilities, combined with minimum missile speed and lethality and GFE detecting capabilities, it is possible to set up a kill zone, in which detection of an incoming missile becomes irrelevant. This is due to the fact that it is no possible to react before impact, and even if a reaction was made the deployment of chaff and flare will cause immediate detonation of incoming missile, and the shockwave will be sufficient to destroy the plane at this distance. This distance is illustrated in Figure 2.



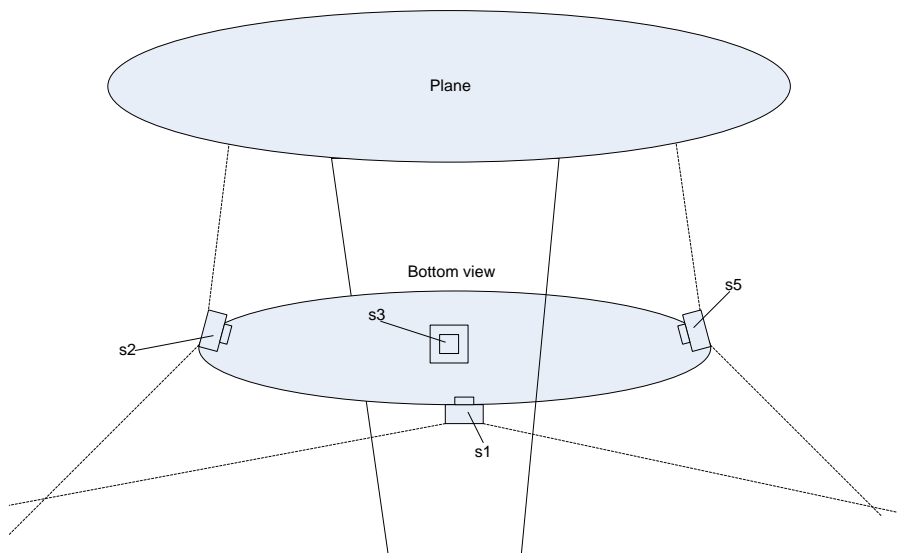
**Figure 2: Aircraft kill zone**

Based on this information and an exact number of sensors, it is possible to determine the placement that achieves maximum coverage outside the kill zone.

The placement is shown in Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8 and detailed below.



**Figure 3: MWS coverage seen from above the plane**



**Figure 4: MWS coverage seen from below the plane**

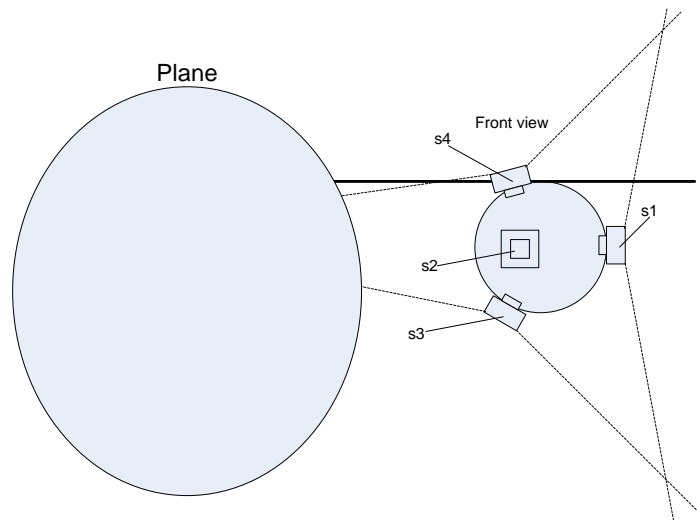


Figure 5: MWS coverage seen from in front of the plane

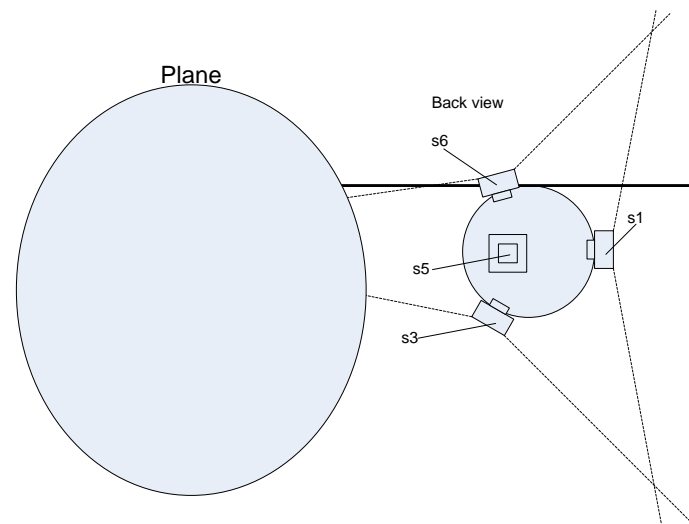


Figure 6: MWS coverage seen from the behind of the aircraft

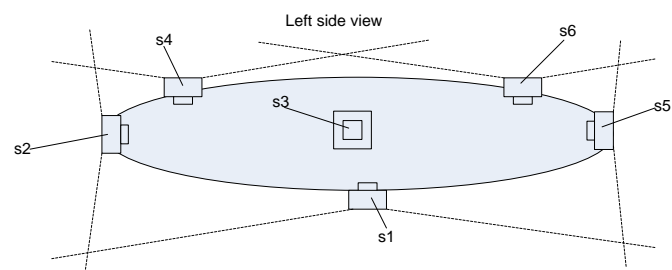


Figure 7: MWS coverage seen from the left side of the POD

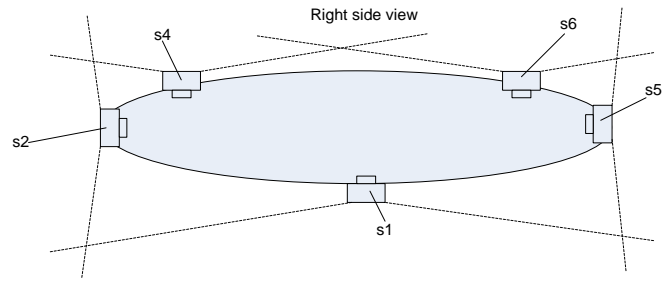


Figure 8: MWS coverage seen from the right side of the POD

The exact angle and location of each sensor may be seen in enclosed technical appendix.

From this information it is possible to determine the planes shading effect, which has been minimized by careful placement, but cannot be completely eliminated without mounting two PODs, one under each wing. In all other directions than the right the sensors fully cover the area outside the kill zone, and the focus will therefore be on the uncovered part to the right of the aircraft. This is shown in Figure 9 and Figure 10.

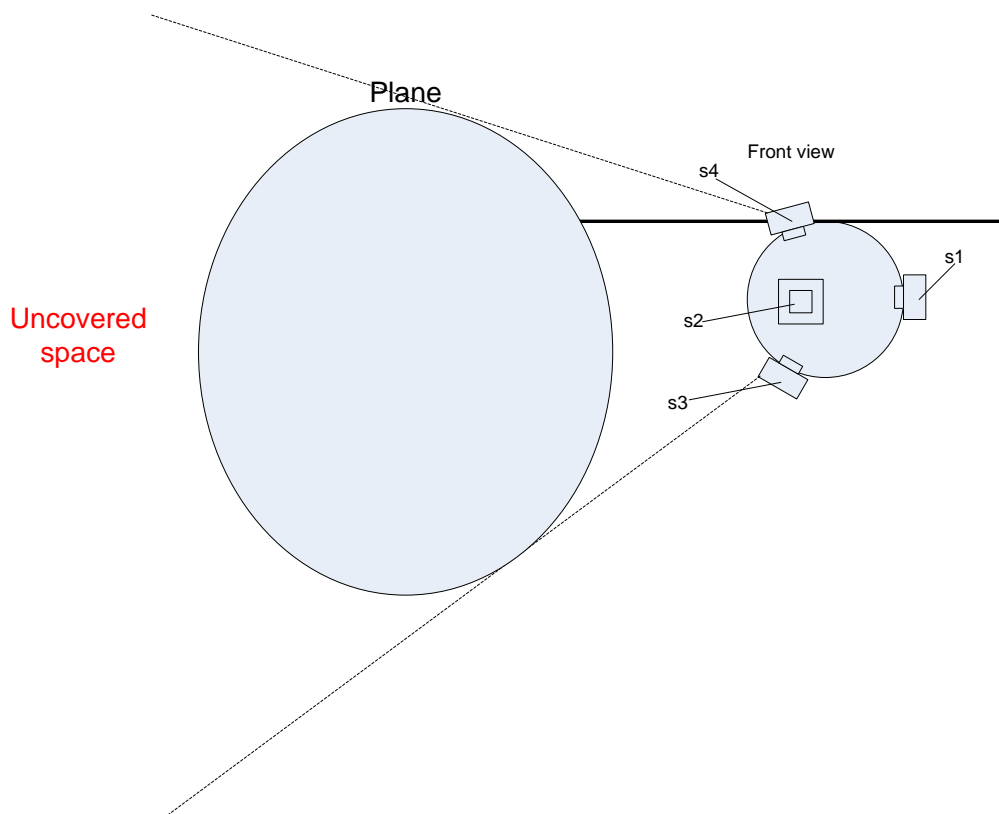


Figure 9: Uncovered space due to aircraft shading vertically

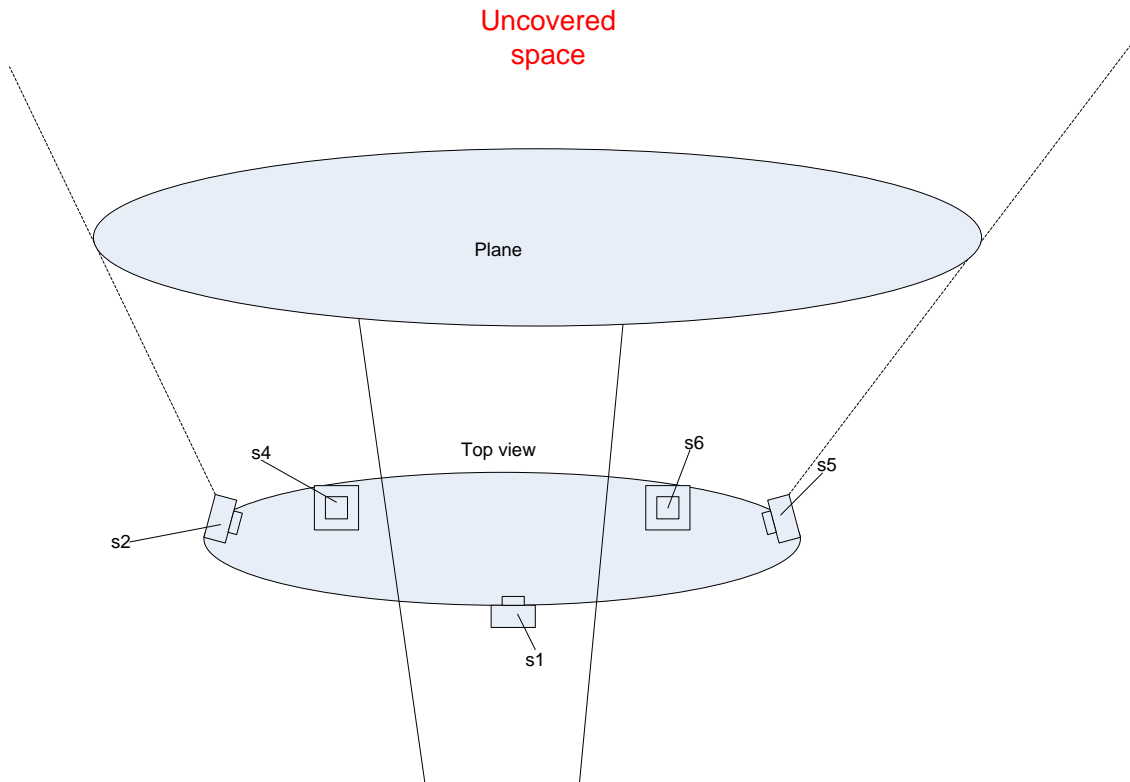


Figure 10: Uncovered space due to aircraft shading horizontally

Based on these drawings and measurements, as well as the expected location of the POD relative to the aircraft, it is possible to calculate the exact size of the uncovered space, as shown in

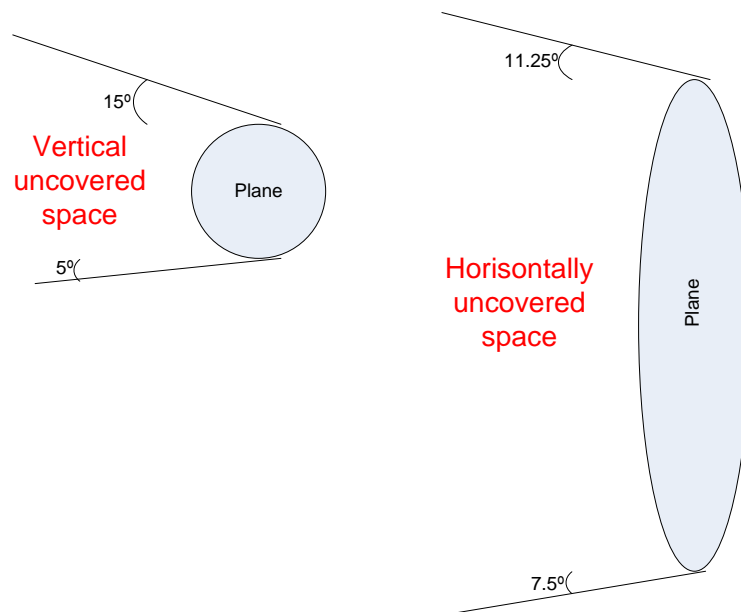


Figure 11: Exact uncovered space due to aircraft shading

Due to the size of the kill zone the height and width of the aircraft becomes negligible, and the uncovered space can be defined as:

- 15° uncovered space above and to the right of the aircraft.
- 5° uncovered space below and to the right of the aircraft.
- 11.25° uncovered space behind and to the right of the aircraft.
- 7.5° uncovered space in front and to the right of the aircraft.

The uncovered space represents a cone covering a total of 5.56% of the total horizontal space and 5.21 of the total vertical space. This gives a total coverage of 94.62% of the space outside the kill zone.

If the POD is mounted closer to the aircraft the coverage will be reduced, and if the POD is mounted further away from the aircraft the coverage is improved.

Due to sensor tolerances and mounting inaccuracies a 5% margin of error must be respected on all angles, resulting in a worst case coverage of 94.35% for the expected POD location.