7.3.4.2 Example C-Band Designs (Continued)

(a) High Power Drain

The high powers are required to obtain the fairly long range of 200 km. It is probable that this figure is too high. Even if it becomes desirable to range out to 200 km, it is unlikely that continuous ranging would be required, i.e. the radar need only be on for some fraction of the time at furthest range.

At shorter ranges, the power required drops rapidly until at about 60 km only one one-hunredth of the mean power is necessary, that is, about 5 W RF. In principle this can be achieved by transmitting short pulses only, and maintaining the peak power.

(b) Mass of HPA

Restricting the maximum rage of the radar to about 60 km reduces the RF output power to about 5 W. In this case, solid-state power amplifiers (SSPA) become feasible. A single 5 W SSPA would weigh only in the region of 5 kg. However, due to their peak power limitations, they would only work with relatively long pulses, implying the need for pulse compression.

(c) Aperture Size

For reasons of spacecraft impacts, it was decided that an aperture of about 1 m diameter was the maximum. This implies an increase by a factor of over 30 in the required mean power. Some trade-off is allowable between trading off increases in the peak power and increases in the pulse length. Increasing the peak power will push the system towards the multipaction zone. Increasing the pulse length degrades range resolution and hence tracking accuracy. An alternative approach is to install pulse compression. At some increase in mass and cost, pulse compression can give the range resolution of a short pulse system with the detection capability of a long pulse system.