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14.1.3 Example: Two parameters varying

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MO2.13

Next, let's consider what happens when multiple parameters vary simultaneously (instead of only one parameter varying). For example, suppose both C_{Dl} and θ_e vary over the ranges given above. Figure 14.6 shows the contours of z_p over these ranges. If we assume that all values of C_{Dl} and θ_e are equally likely to occur, then the fraction of area in the contour plot for which $z_p < 9$ km will be the probability of $z_p < 9$ km occurring. From the contour plot, we see that $z_p < 9$ km is roughly a trapezoidal. On the left (at $C_{Dl} = 1.5$) , the trapezoid extends from $\theta_e = 80°$ to approximately $83.4°$ (for a height of $3.4°$). On the right (at $C_{Dl} = 1.9$) , the trapezoid extends from $\theta_e = 80°$ to approximately $81.6°$ (for a height of $1.6°$). The base of the trapezoid is 0.4 (from 1.5 to 1.9 along the C_{Dl} axis). Thus, the area of the trapezoid is then approximately $0.4\,(3.4 + 1.6)\,/2 = 1.0$. Since the total area of the possible values of (C_{Dl}, θ_e) is $(0.4)(6) = 2.4$ then the probability of $z_p < 9$ km is approximately $1.0/2.4 \approx 0.42$.

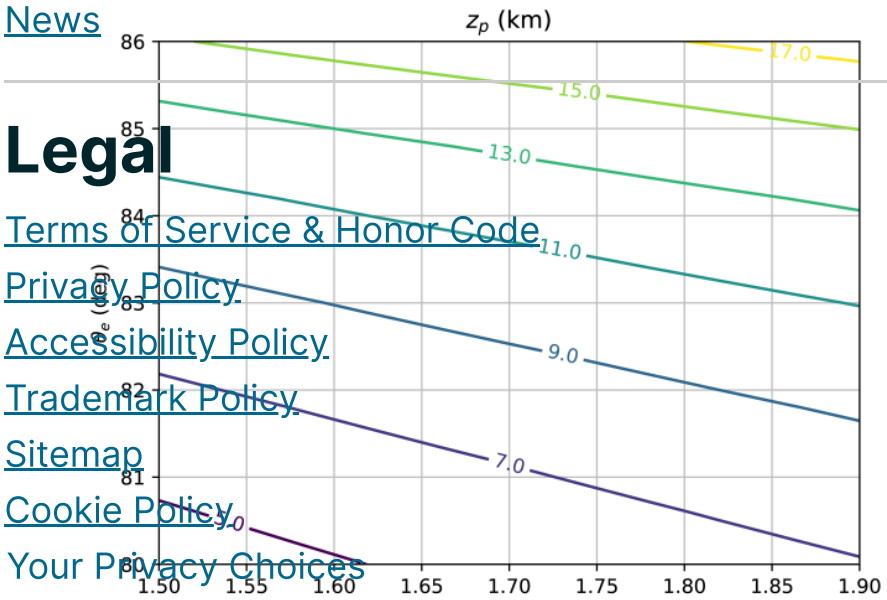
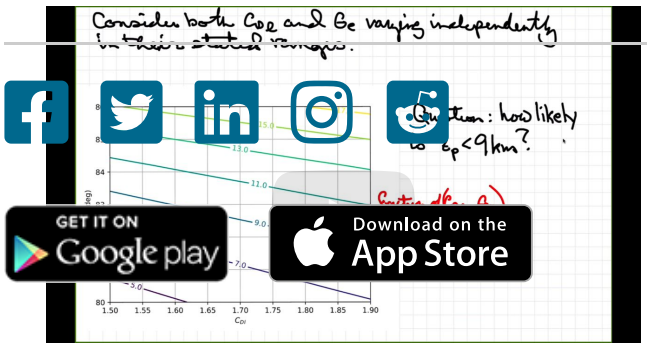


Figure 14.6: Contours of z_p showing impact of C_{Dl} and θ_e variation on parachute deployment altitude.

Video considering two parameters varying for Martian lander example



Start of transcript. Skip to the end.

PROFESSOR: OK, now let's consider two parameters

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