WALKIN Maneuver Size Selection

4 or 5 Walkin Maneuvers ?

Table 3: Aerobraking Maneuvers with Equal h_s*, 150 km AB-1

AB-#	H_o (km)	ρ_o (kg/km^3)	h_o - h (km)	ΔV (m/s)	h_s* (km)	Qdot (W/
2	**150**	**0.168**	**22.7**	**0.91**	**3.4**	**0.0009**
3	**127.3**	**4.72**	**11.5**	**0.46**	**3.4**	**0.026**
4	**115.8**	**25.6**	**5.8**	**0.23**	**3.4**	**0.14**
Post AB-4	110	60				0.33

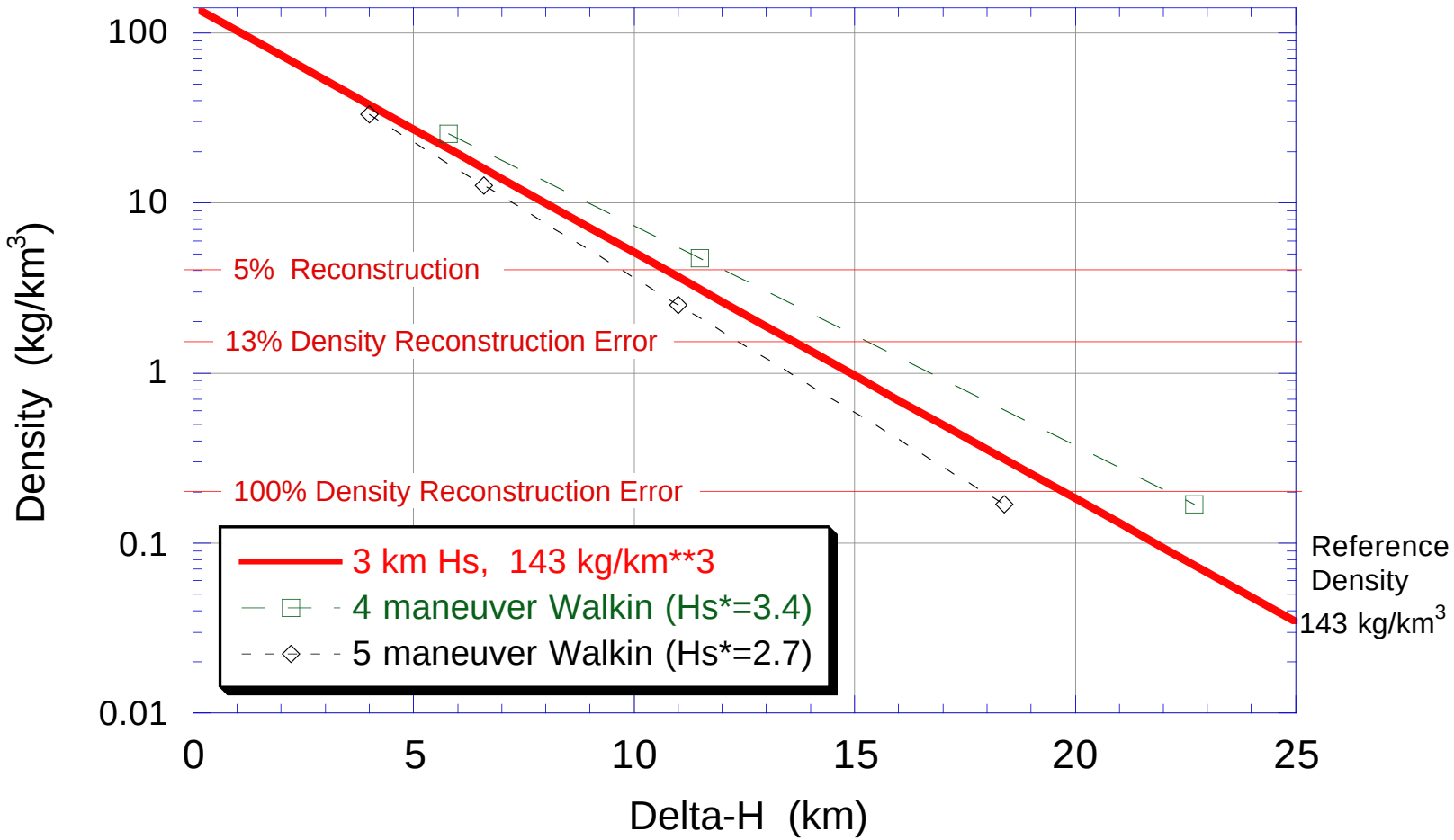
Table 6: FOUR Aerobraking Maneuvers with Equal h_s*, 150 km AB-1

AB-#	H_o (km)	ρ_o (kg/km^3)	h_o - h (km)	ΔV (m/s)	h_s* (km)	Qdot (W/cm
2	**150**	**0.168**	**18.4**	**0.74**	**2.7**	**0.0009**
3	**131.6**	**2.51**	**11.0**	**0.44**	**2.7**	**0.013**
4	**120.6**	**12.6**	**6.6**	**0.26**	**2.7**	**0.070**
5	**114.0**	**33.3**	**4.0**	**0.16**	**2.8**	**0.18**
Post AB-5	110	60				0.33

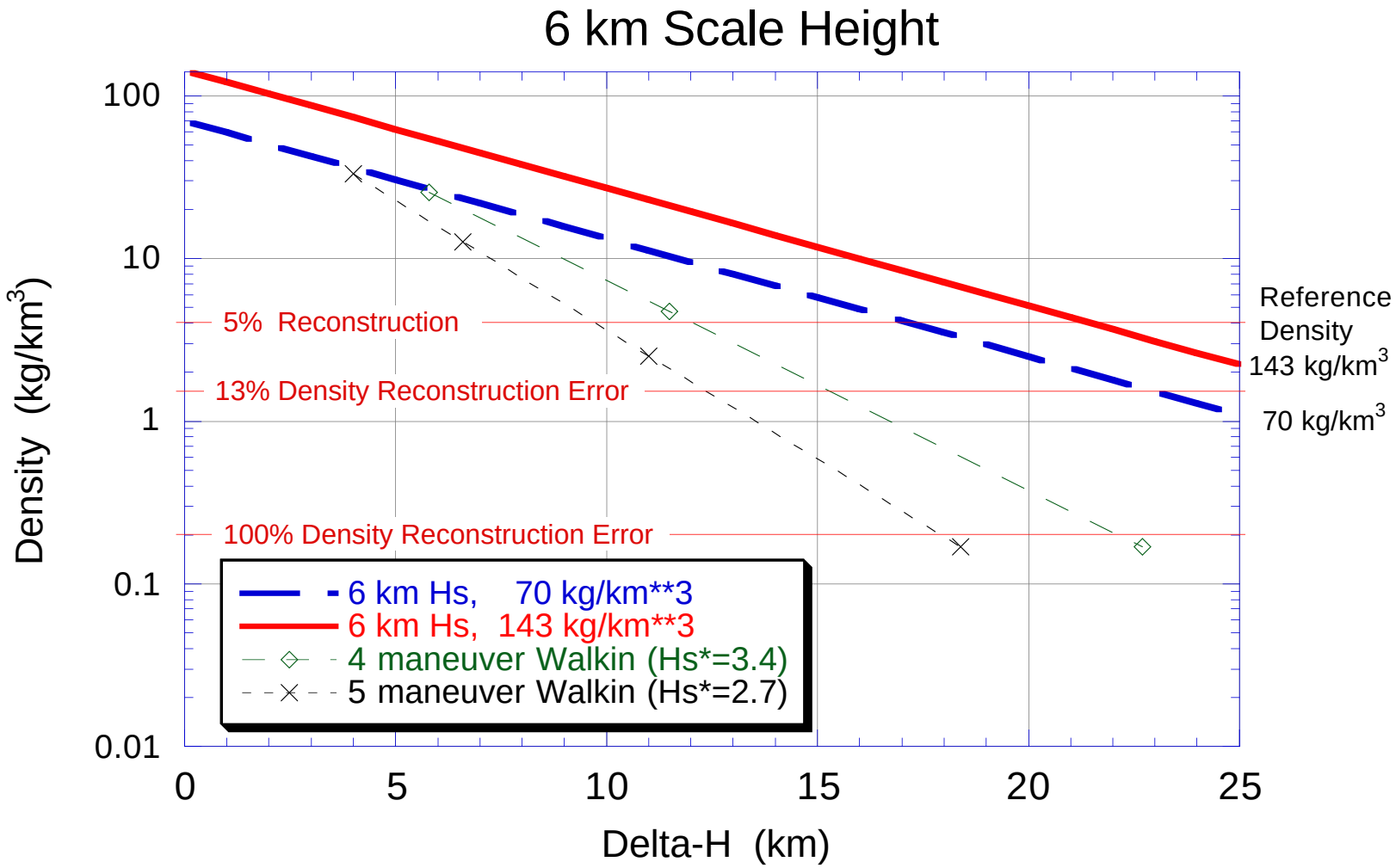
Equalize Critical Scale Heights

Split Walkin into 4 or 5 Maneuvers ?

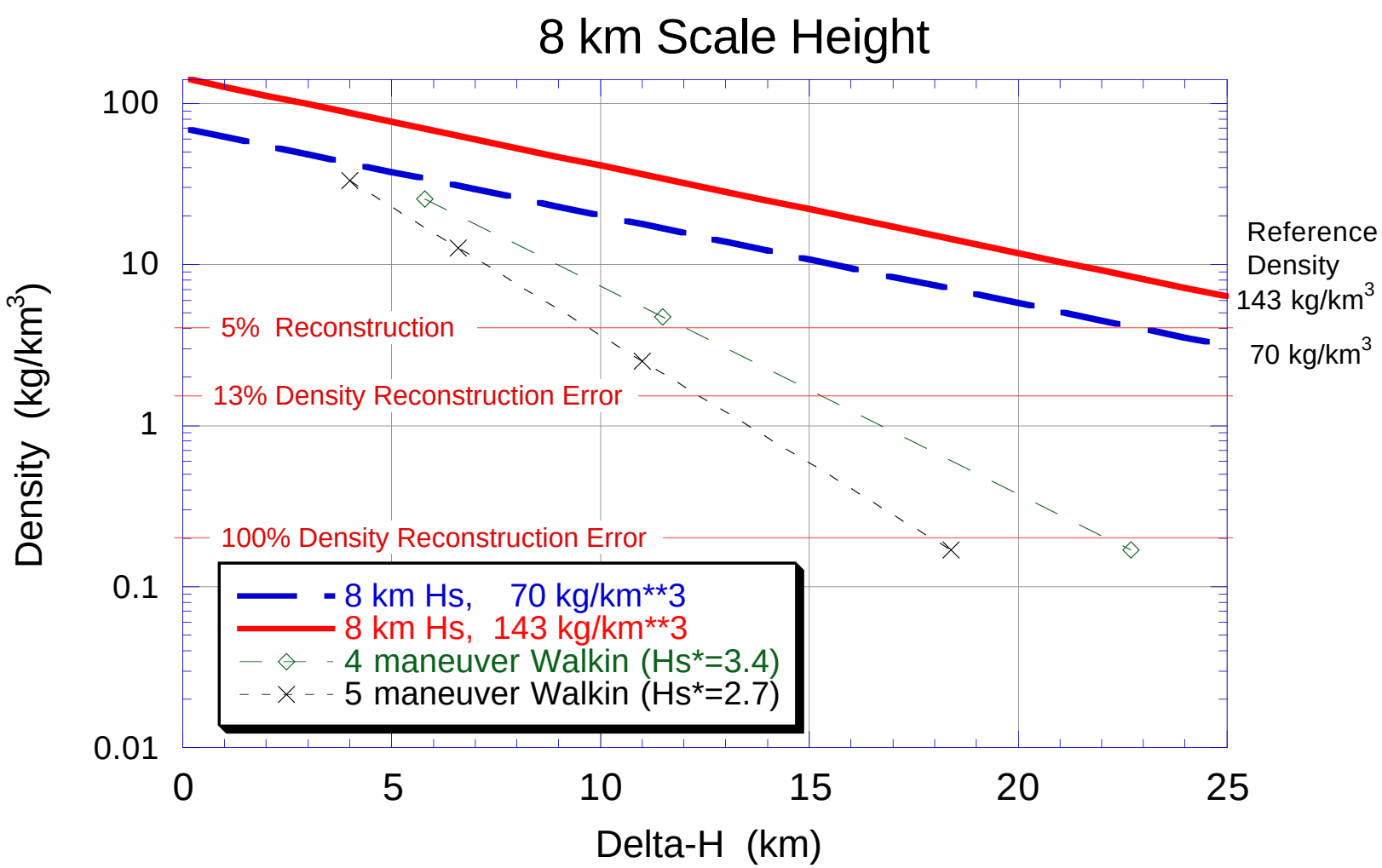
3 km "Maneuver Design" Scale Height



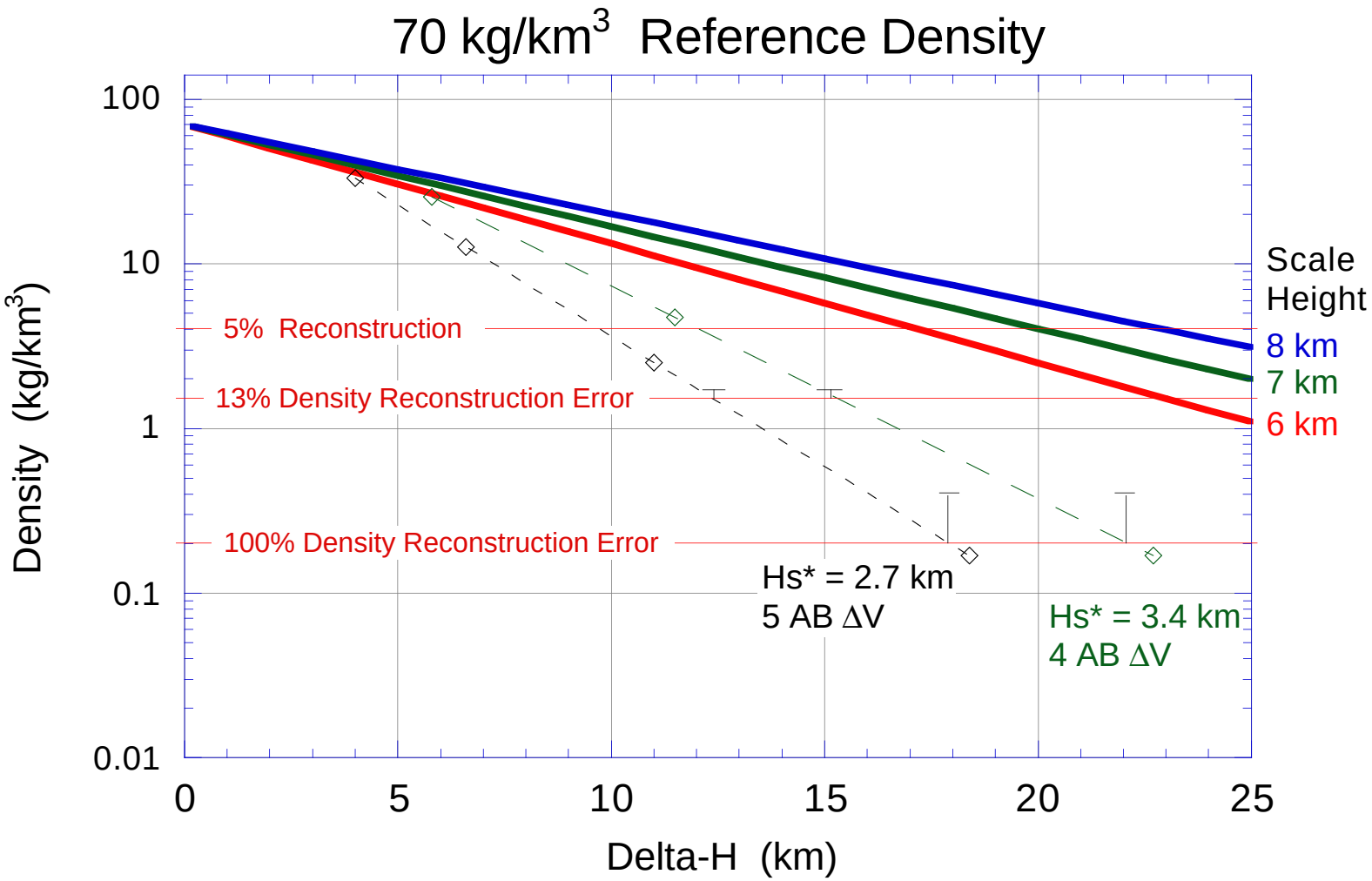
6 km Minimum Possible Scale Height



A More Realistic Scale Height ?



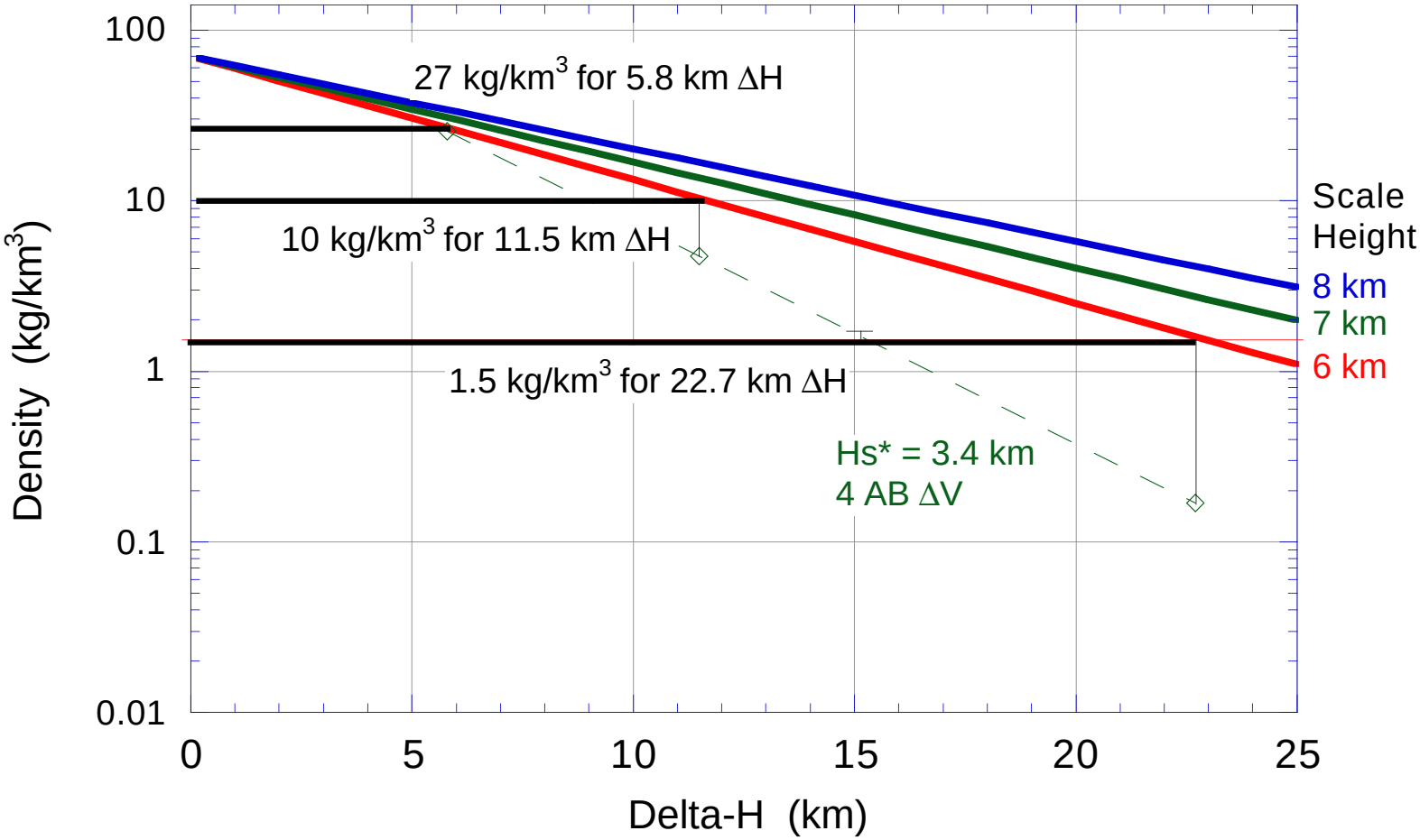
Negligible Density Reconstruction Errors



Set Maximum Density for No Overshoot

Maximum Density Thresholds for 4 Maneuver Strategy

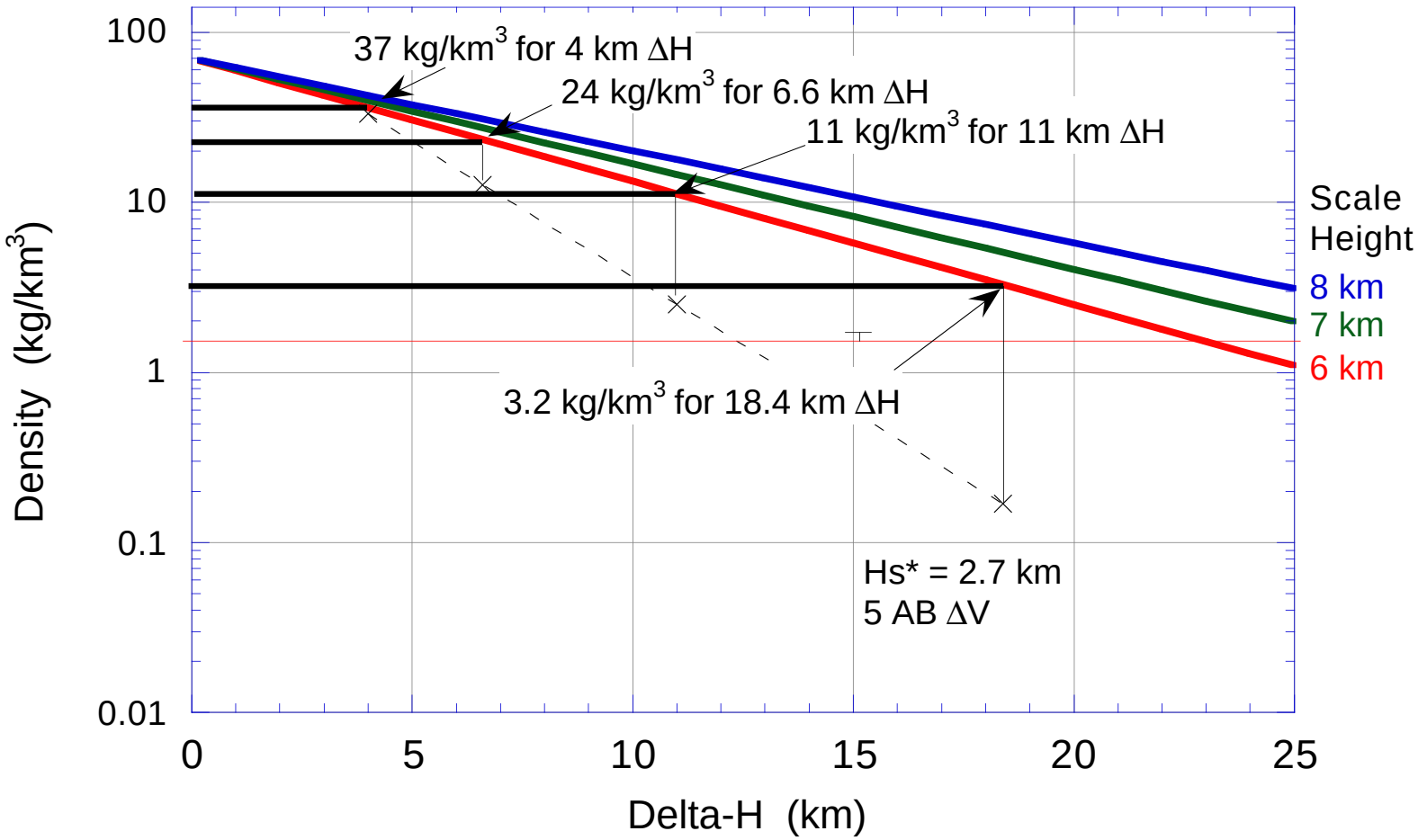
70 kg/km^3 Reference Density



Set Maximum Density for No Overshoot

Maximum Density Thresholds for 5 Maneuver Strategy

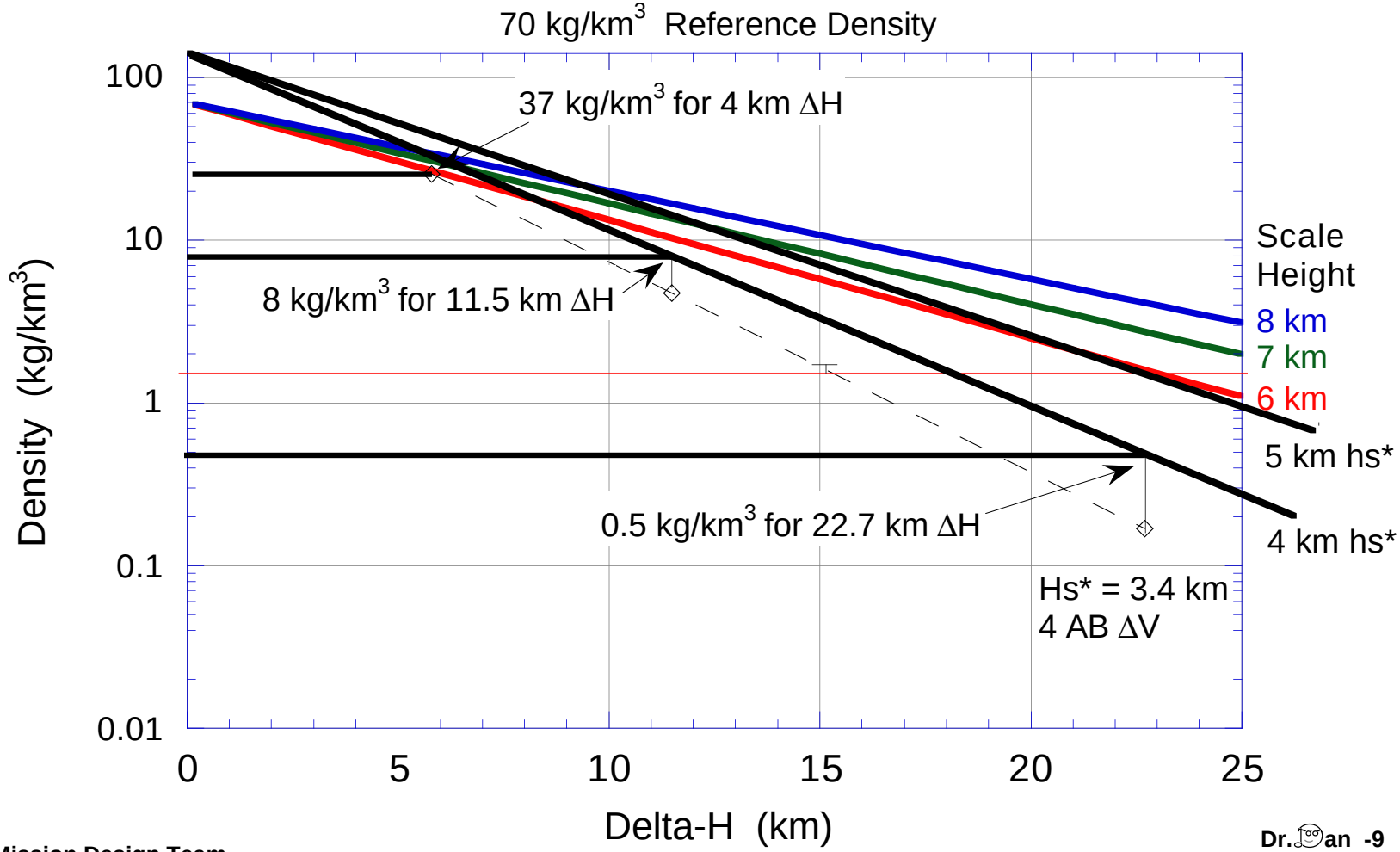
70 kg/km^3 Reference Density



No Overshoot & Critical Scale Height < 4 km

Maximum Density Thresholds for 4 Maneuver Strategy

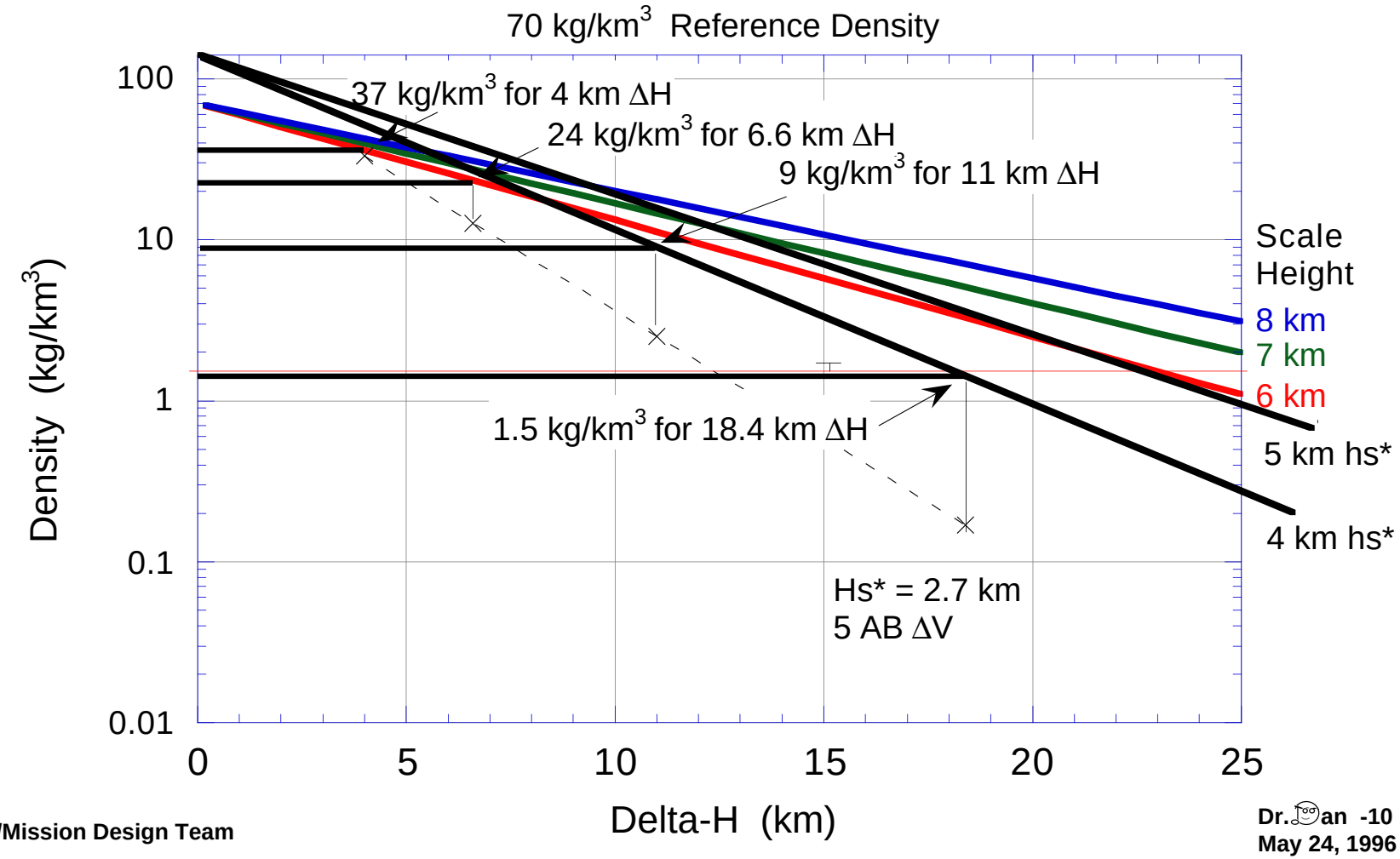
Maximum Hs* = 4 km, Don't Overshoot 70 kg/km^3 Main Phase



No Overshoot & Critical Scale Height < 4 km

Maximum Density Thresholds for 5 Maneuver Strategy

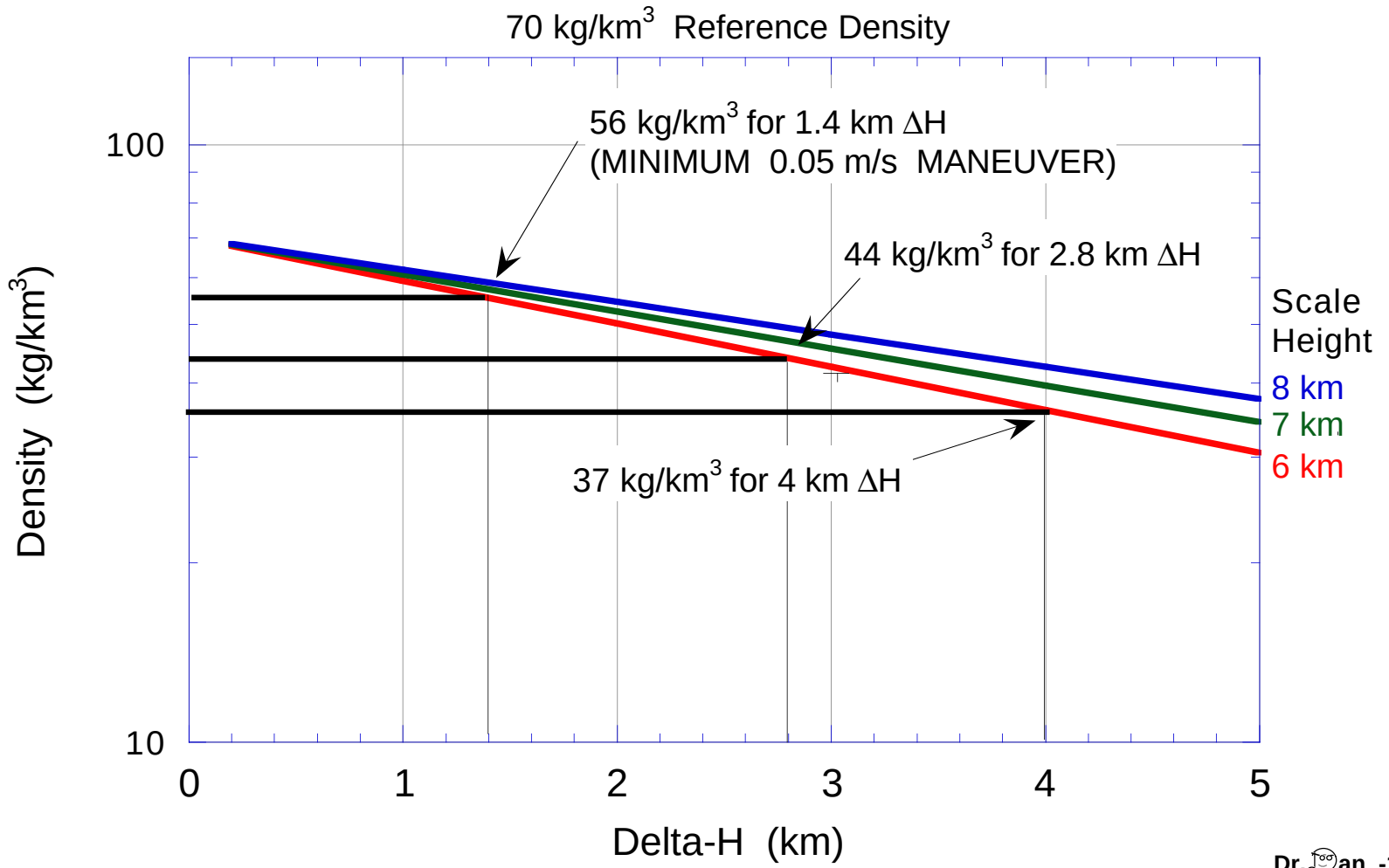
Maximum Hs* = 4 km, Don't Overshoot 70 kg/km^3 Main Phase



Next Set of Maneuvers - Same for BOTH

Maximum Density Thresholds for Early MAIN PHASE

Don't Overshoot 70 kg/km^3 Main Phase



CONCLUSIONS

- Adding a Walkin Maneuver is only a question for the BASELINE
- The Real Issues are:
  - What are the Maneuver Sizes ?
  - How Many Maneuvers should we expect ?
  - How do we Pick the Maneuvers during Operations ?
- Developed a Very Conservative “Max. Density” Threshold for Switching to the next smaller maneuver.
  - Try not to overshoot the Main Phase Density ($\approx$ 70 kg/km^3)
  - Keep the Critical Scale Height less than 4 km.
- Early testing (a single case) using these criteria resulted in EIGHT Maneuvers to reach a density greater than 60 kg/km^3 !
  - Implies the FAST WALKIN is very desirable.
  - Is this approach TOO Conservative ?