Varying International Space Station Re-entry Angle to Minimize Debris

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The objective of this study was to determine the optimal flight path re-entry angle during the end-of-life of the International Space Station (ISS) that would be most effective at minimizing debris. It was postulated that the shallowest re-entry angles would be most effective, as they would allow the ISS to spend an extended amount of time in the atmosphere where ablation would occur. The chosen approach to this problem was to create an iterative Java program to model varying re-entry trajectories of the final stage of the ISS's deorbit. This model also proved to be applicable to other large re-entering spacecraft. The initial theory was entirely supported by the results of the model. There was a clear correlation between re-entry angle and residual ISS material predicted to return to earth as debris, which confirmed the premise that shallow re-entry angles are best suited for destructive controlled re-entry of spacecraft. The model used to predict ISS re-entry mass was validated through use of Russian MIR re-entry parameters, returning a result within 10% of the reported returned mass.

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