Team #15

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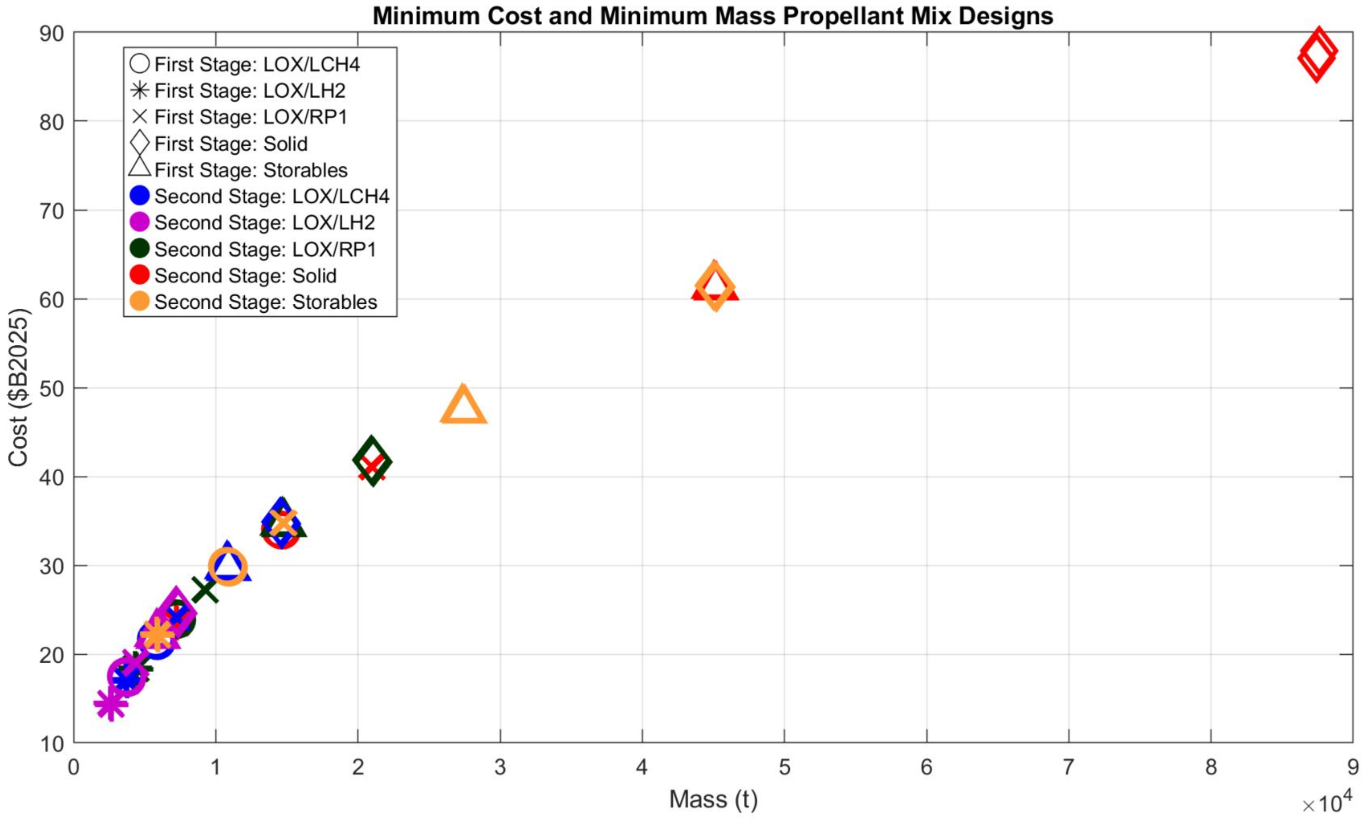
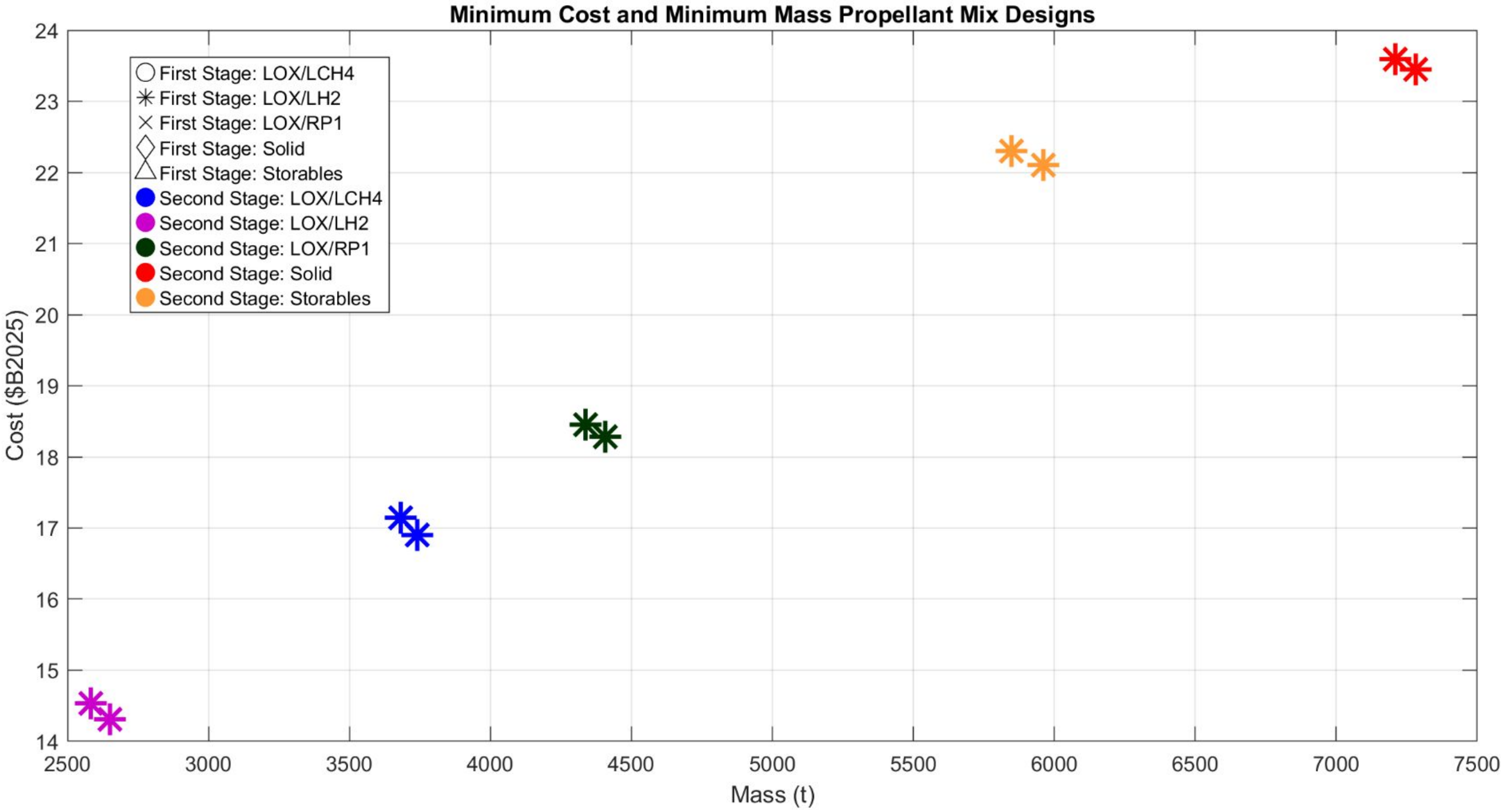
Matrix of Resposibility:

First stage prop. (columns) - Second stage prop. (rows)	LOX/LCH4	LOX/LH2	LOX/RP1	Solid	Storables
LOX/LCH4	Ben	Ben	Ben	Ben	Ben
LOX/LH2	Sara	Sara	Sara	Sara	Sara
LOX/RP1	Spyros	Spyros	Spyros	Spyros	Spyros
Solid	Sophie	Sophie	Sophie	Sophie	Sophie
Storables	Chris	Chris	Chris	Chris	Chris

Full Graph of Results



Top Mass/Cost Results



Trade Study and Conclusion

- From the data, the LOX/LH_2 + LOX/LH_2 combination was most optimized for mass and cost
  - Minimum Mass: [2582 (t), $B2025: 14.53]
  - Minimum Cost: [2650 (t), $B2025: 14.31]
- H_2 is temperamental
  - It needs cryogenic cooling, the technology for which is not available
- Higher I_{sp} in electric, but provides low thrust
  - Isp doesn't paint a full picture of how to get a launch vehicle from the ground into space
  - Future analyses will paint a fuller picture by deriving $\dot{m}$ from T2
- Our analysis is dependent on consistent $\boldsymbol{\delta} = 0.08$, this might not be reflective of actual performance

Driving “top” results

- The Isp of the first stage seems to be a strong driving force.
  - The higher the initial Isp the lower the cost and minimum mass
- In accordance with what we have learned in lecture, the higher the Isp, the higher the force per kg provided
- The Isp of the second stage also makes an impact on the minimum cost and mass as a two stage rocket uses all of its resources.
  - The second stage Isp seems to be the deciding factor if, within the subset of the first Isp, the launch vehicle will be at the top or bottom mass/cost for the group.
- Looking at the ΔV equation, I_{sp} directly correlates to its value

$\Delta V_i = - V_{e,i} * \ln(m_{f,i}/m_{in,i})$	$I_{sp} * g_o = V_e$