

Team #15

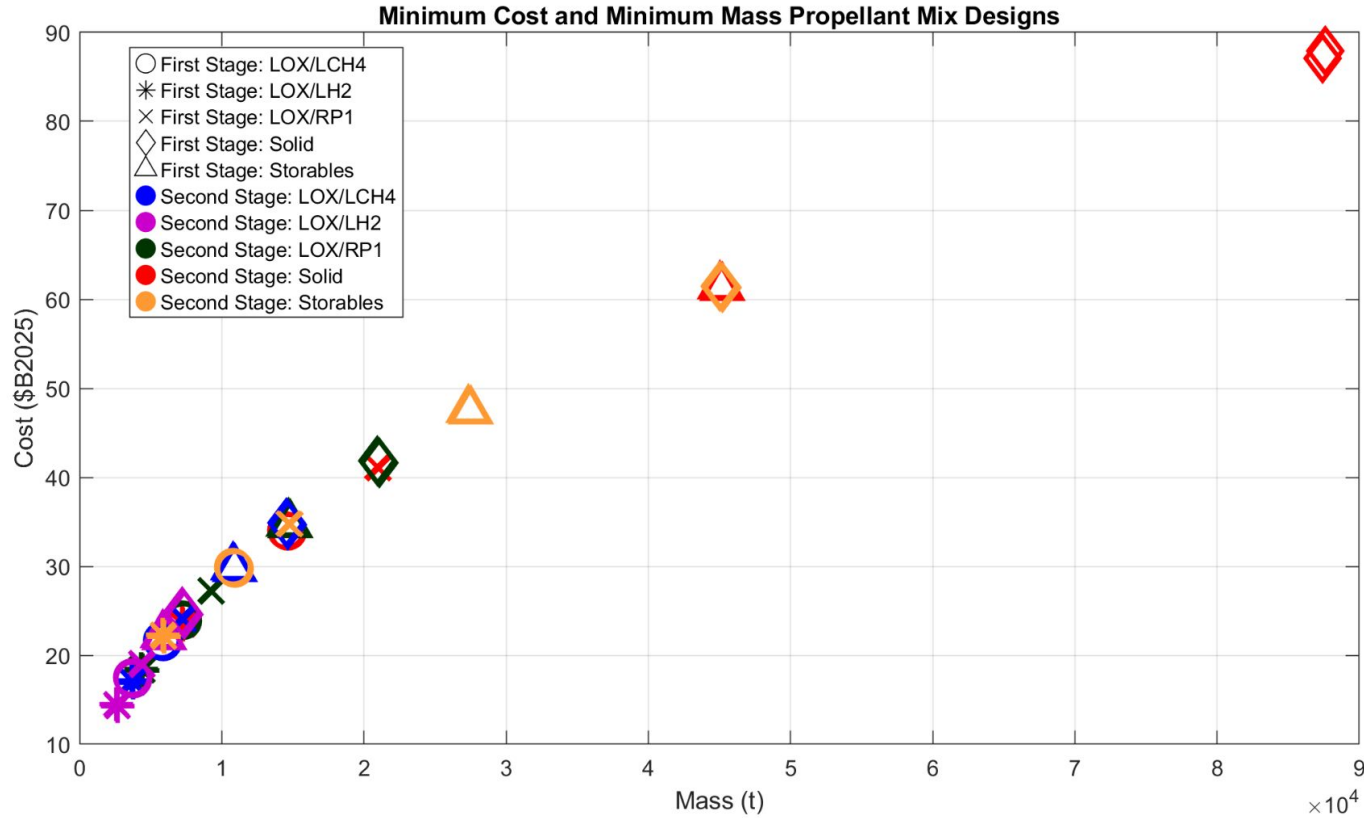
Sara Carter · Sophie Jack · Ben Eber · Spyridon
Mazis · Chris Witherspoon



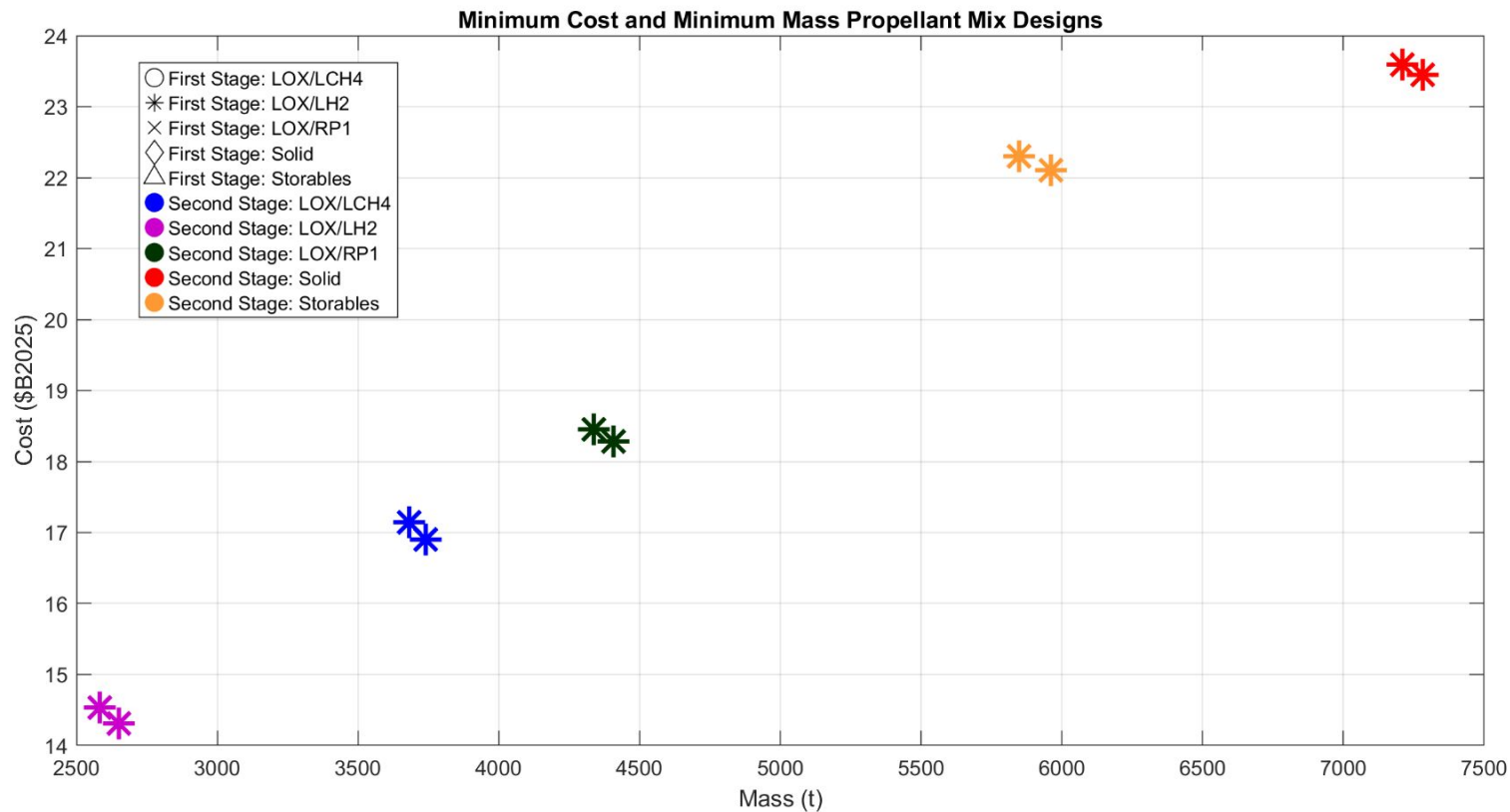
Matrix of Responsibility:

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/LH₂ + LOX/LH₂ combination was most optimized for mass and cost
 - Minimum Mass: [2582 (t), \$B2025: 14.53]
 - Minimum Cost: [2650 (t), \$B2025: 14.31]
- H₂ 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 $\delta = 0.08$, this might not be reflective of actual performance

Driving “top” results

- The I_{sp} of the first stage seems to be a strong driving force.
 - The higher the initial I_{sp} the lower the cost and minimum mass
- In accordance with what we have learned in lecture, the higher the I_{sp} , the higher the force per kg provided
- The I_{sp} 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 I_{sp} seems to be the deciding factor if, within the subset of the first I_{sp} , 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

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