

DIY space transport

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It is a bit of a dream of mine to build a small semi self sufficient space station in LEO, (with a large engineering workshop of course), and set up as a developer and tester of space based infrastructure as required for what would eventually pass as the space handy person market. Refining the development of small solar power systems, farming, mining, refining, manufacturing, habitat making, transport systems, etcetera.

This is a DIY job which requires a small cheap and convenient space transport pickup truck and the means with which to build a small space station – that would grow in an organic fashion. Could this potentially be accomplished by a lone, well off and capable person, (assuming use of earth based contractors), as opposed to a standing army?

Spaceshipone has a drymass around 2000kg. A space transport capable of carrying a single person, and a reasonable excess baggage allowance, might have a drymass as low as half of this – and perhaps even a similar cost? The space transport might look something like the t/Space CXV with much larger propellant tanks, much smaller cabin volume – and no aeroshell.

Air launch is necessary for a number of reasons, starting with the need to avoid aerodynamic drag at such a small scale. Obviously high launch pad fees will not be sustainable, this will want launch site flexibility and perhaps the capacity to launch from international waters. This needs to be capable of less than \$100/kg to LEO.

It should be possible to build a specialist carrier aircraft for only a few million, this is more about climb and ferrying than efficiency – large fabric covered wings, basically an oversized ultralight. It would be nice to be able to carry bulky but light weight components in front of the space transport vehicle, (like thin wall habitat pressure vessels). This should be possible with air launching, the aircraft would likely have a large protective aeroshell for the space transport, and release at low dynamic pressure. If need be a very light weight fabric tent like structure could be placed over such external loads to ease asymmetric aerodynamic loads. With such a space transport a small transport it should be feasible to eventually assemble a very large space station.

DIY space transport

Along the minimalist design philosophy I was considering a skydiving parachute approach to landing. Using various tricks it should be possible, for a 2–3% drymass mass cost, to have pin point flared landing of the space transport on its side on a soft surface, (e.g. sand). The seat would probably be a very light weight hammock type design and I am even wondering about closed circuit TV, (some entirely independent), instead of portholes. If need be one might pop the hatch and stick ones head out to control the landing – or have an outside seat. Another thought is mid air LOX fuelling of the space transport from the carrier aircraft so as to minimise insulation.

The question of two stage verse one stage is a tricky one. I am starting to favour single stage, which will be technically more challenging, as second stage recovery from flexible launch locations will be highly problematic. Single stage is more in keeping with the single person operation – excepting the carrier aircraft pilot of course. The point of the carrier aircraft design is that GLOW is not a design constraint. Space transport GLOW might be around twenty ton.

I am considering the absence of an external aeroshell over the entire space transport. The nose might consist of a large diameter miniature capsule in which the pilot is situated. This would take the brunt of the re–entry load and might even offer various separation and abort capacities. The perhaps axis–symmetric multiple tanks would be aft of this and while possessing some direct insulation and shielding there would be no covering aeroshell over the intertank and capsule regions. Hopefully the small scale, low re–entry heat loading, and high altitude launch would make such an un–aerodynamically compromised design possible. The open tank format would hopefully make maintenance easier, increase frontal area during re–entry, and enable the capsule door to be located at the back of the capsule away from the re–entry shield.

Such a miniature space transport design can I think reach assisted SSTO performance requirements. If one can air launch, scale effects actually favour smaller vehicle size with regard to drymass, and re–entry – except for fixed guidance system weights, which continue to reduce with each passing year. The engine design will be critical, something like a miniature Merlin designed solely for vacuum. Throttling will be highly desirable, and/or a multiple engine design.

The price tag to develop such a space transport and to start building such a space station is probably 50 million at a minimum, (~twice Spaceshipone, ~maybe half the larger Falcons). I had better start putting away a little extra each week. :-)

Pete.

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