

Chapter 1 “Imagine a World”

H₂LiftShips, a tech manual for a future

Imagine a world, exactly like ours, but different

Homo sapiens, seemingly obsessed with exploring every corner of this world, are working hard to leave our planet of birth and visit our neighbors, be it local planets or distant stars.

Are we overly friendly, have a desire to conquer all we see, or just bored with our all too familiar dirt and rocks, ice and water?

Our extensive oceans have never been a place where humans want to stay. Too wet, too salty and, now, too polluted.

It is a long, slow, hard slog to get anywhere in our heliosphere. Distances are so vast that other stars are out of reach except in our collective fecund imagination. We have dedicated so much time and knowledge to traveling light-years, we have neglected the initial fact: We have to get started before we can go forward.

Having a few dozen humans, a couple of dogs, and a monkey or two is not enough to validate an outer space colony. Whole populations need to move up and out, beyond the east side. Let's face it; we can barely travel 100 miles or even 160 kilometers without a pee stop. Light-years are just a concept with no meaning to virtually all of the primates on this planet.

All we have now are tubes of explosive gases and solids pushing off this great earth. Our proposal is a launch with a first stage hydrogen floater.

Our goal here is to build a future story-world based on an active Earth-space culture, not with rockets but solar sails. We will glance at the historical record, and then move on to future history, looking backward.

This story is a precursor to our space opera, which brings our characters, Jack and Tang, interacting with a LiftShip and Boost Crew.

"The only constant is change, and it is a variable" - Bob

Space exploration is neither cheap nor easy, nor safe.

Anyone with a spare \$20 million or so can book a ride on an ISS re-supply rocket or for \$500,000, a trip to the outer atmosphere on a joy-ride flight. Prices may vary, depending upon where you live, local weather, or competition.

Our proposed method of transit to a low Earth orbit is cheaper but not necessarily more straight-forward nor safer than our current military derived rockets based on explosive/push formulas. This requires a slight modification of the fuel delivery system, using a pull-design for a more controlled ascent.

A modified Einstein equation, from $e=mc^2$ to $e=mCc$, indicates that Hydrogen/Oxygen rockets are not the only way to use mined and modified compounds to break free of our home rock's gravity well.

We have all the components in place to make cheap space flight a reality:

- Abundant Hydrogen and Oxygen
- High altitude balloons
- Solar Sails

H₂LiftShip Procedure Overview:

1. Use a (very large, very dangerous) Hydrogen balloon to rise to the edge of space.
2. Fire off Hydrazine boosters as the 2nd stage of the launch once the ship has come to a neutral, balance point some 30km off the Earth's surface.
3. Compress the Hydrogen and gently burn it with Oxygen to continue to boost the

system out of the atmosphere, being careful not to blow up the ship or fall back to Earth in a Hindenburg scenario.

4. Convert the now empty balloon to a solar sail and head off into the cosmos.

Even after a Hydrogen rocket boost, H₂LiftShip move slowly compared to rockets. Random photons pushing on a sail means that it takes a while to build up speed. Stronger pushing is possible when the photons are stacked one after another in a tight beam. Adding the punch of a lasers' muscle can power them aloft and away.

After a few days travel near Earth the ship sidles up to the boost hubs located at the Lagrangian points:

- Harvesting free solar energy, then selling a laser speed kick, is societal administration at its best, complete with overpricing.
- Conversely, the same laser burst can slow down an incoming LightShip before injection into an Earth / Luna orbit. Brake fees apply, calculated by speed, weight, and bureaucratic whim.
- There is not enough solar insolation at the far reaches of the solar system to power a laser pulse when traveling inward, but a small nuclear reactor is an excellent adjunct to a laser punch.

Simple, not stress-free, not necessarily safe, but cheap, and we all know that we need to get off this rock to survive and grow.

Of course, Hydrogen cannot lift forever, and relentless acceleration is needed to drive mass out of our gravity well without the balloon lift. Before H₂Lift Ships, enormous metal tubes, hoisted on tails of fire, hurled ship and cargo into space. In the H₂LiftShip era, Hydrogen supplies both the lift and, when added to Oxygen, the energy needed to boost the ships to a higher

path. Hydrazine rocket boosters can be used for heavier loads once the H₂LiftShip reaches a stable point high in the atmosphere.

As the ship rises, the reduced pull of Earth's gravity yields a small but significant reduction in the ship's weight.

Hydrogen gas, compressed and pumped to the rocket nozzles, combined with Oxygen and ignited, thrust the ship forward and lessen the grip of Earth's gravity. Once free of the constraints of atmospheric drag, the now-empty Hydrogen balloon is ready to be cinched into an enormous solar sail configuration.

It took many failed launches to get the system right. Only a skilled crew with a coordinated booster, navigation, sail handling, and command structure could successfully handle the transect to orbit.

Now, Hydrogen and Oxygen originally used for lift AND acceleration of a rocket are tweaked for lift, THEN acceleration based on the modified equation.

The prototype H₂LiftShip used mechanical/electrical compressors and pumps, but the explosive nature of Hydrogen gas caused a few too many disasters, and most ships switched to non-metallic hardware. Any electrical systems were turned off or isolated in a containment section until most, if not all, of the Hydrogen is purged. After continued use, that tiny element, Hydrogen, saturates all equipment, and modern H₂LiftShip s refrained from any electrical equipment that could cause sparks to fly.