

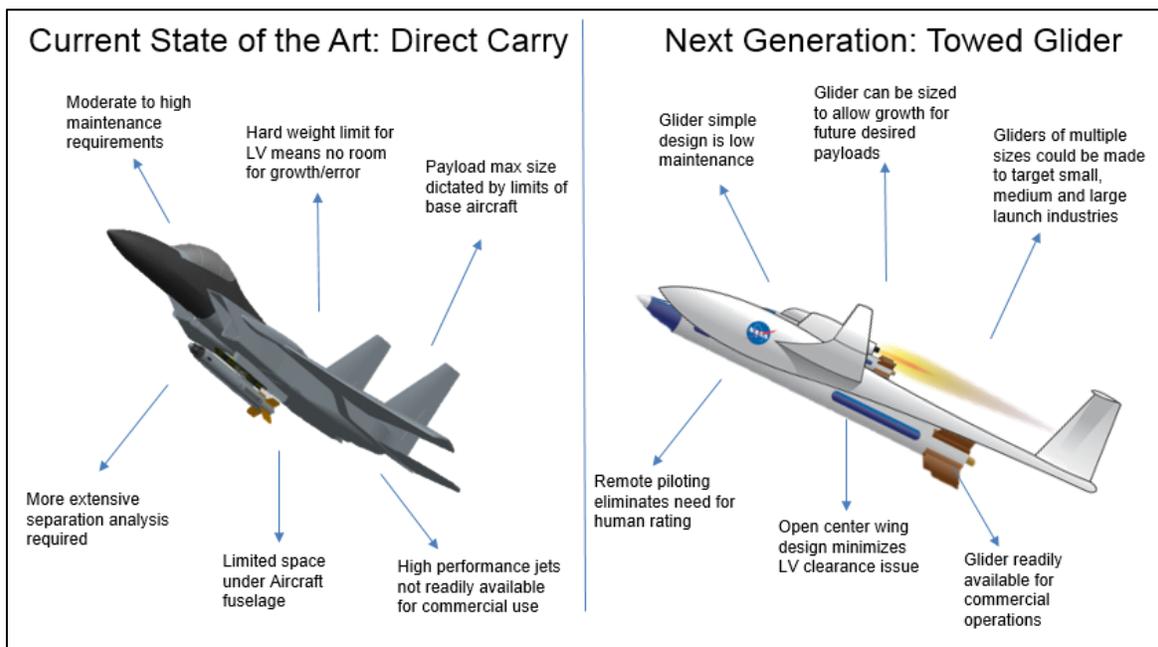


Why Towed Glider over Direct Carry?

Towed Glider combines the best features of various air launch projects into a single package, making it the most efficient, highest performance solution for air launch:

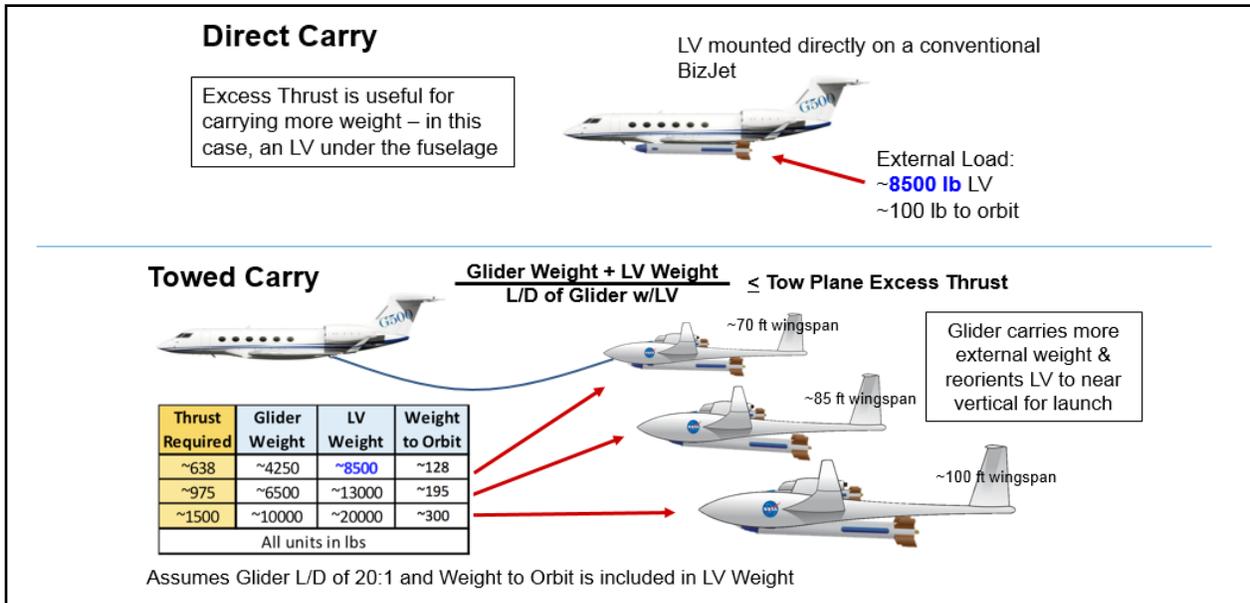
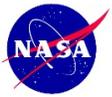
Towed Glider is designed specifically for vertical air launch

Ground launch starts with the LV in a vertical attitude. Most air launch systems can only carry and release the LV horizontally, leaving the LV to expend its own energy to reorient itself to near vertical before beginning the ascent to orbit. This reorientation significantly reduces the mass the LV can place into orbit from 40,000 feet, or, put another way, reorienting the launch vehicle with the glider PRIOR to release and LV ignition yields a 30% increase in payload mass to orbit versus a similar LV air-launched horizontally at 40,00 feet. Only specially designed, high-performance aircraft, such as the F-15 (ALASA, SALVO) or TGALS, have the ability to perform a maneuver to reorient the LV to near vertical before release. Unfortunately, the F-15 is not available for commercial use, so its utility as a launch platform is limited to highly specialize military operations. The TGALS glider is readily commercializable.



Towing leverages the laws of physics for greater performance

Excess thrust defines how much extra energy there is to do work with the aircraft while it is performing in flight. 1600 lbf of excess thrust means an existing aircraft (modified for direct carry) could carry an 8500 lbm LV (~128 lbm satellite) or it could tow a 10,000 lbm glider that is carrying a 20,000 lbm LV (~300 lbm satellite). Towing leverages the laws of physics to make the most efficient use of the energy (excess thrust) available, analogous to how towing a fifth wheel trailer allows a pick-up truck to tow much more weight than it could ever directly carry in its bed. The high lift-to-drag ratio glider acts as an extremely efficient, dedicated wing for the LV, so the tow plane only has to overcome the additional drag. Any existing aircraft that can be modified for tow can make best use of its excess thrust by employing a glider to carry additional weight.



Glider is purpose-built for air launch operations

Existing airplanes have built-in hard limits on what they can accommodate, so the size and weight of the Launch Vehicle (LV) must fall below the hard limits. Designers are always pushing up against these limits to try to give customers the biggest payload to orbit possible. Any changes to the LV for safety or mission assurance results in a reduction in the amount of payload that can be put into orbit. Many programs (SALVO, ALASA, Go Launcher, etc.) have run into problems designing a LV that can remain below the hard limits and still meet safety and mission assurance requirements while delivering a payload of the desired mass to orbit. TGALS is a relatively inexpensive glider, which can be designed bigger than required for the target payload-to-orbit size, so some growth or weight increase in the LV can be absorbed. Other purpose-built aircraft, such as Stratolaunch and White Knight II, can also take advantage of this, however being manned aircraft they tend to be very expensive to build and operate.

