

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems (4)

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THE AUSTRAL LAUNCH VEHICLE: REDUCING SPACE TRANSPORTATION COST THROUGH  
REUSABILITY, MODULARITY AND SIMPLICITY

**Abstract**

Re-usable launch vehicles (LV's) have long promised significant cost reductions, but experience with operational vehicles has shown that re-usability alone is not sufficient to realise cost savings or increased reliability. This leads to the current situation where all operational launch vehicles are expendable, and the majority of LV's under development are also expendable systems (e.g. Space Launch System, Angara, Ariane 5 ME / 6).

This project originated as an investigation into the additional requirements that will ensure that re-usability can provide real launch cost reduction. Through market studies and programme cost estimates these requirements have been identified as modularity, flexibility and simplicity. Modularity is required to increase vehicle flight rate (servicing a wider payload range by using different configurations of standard modules) and reduce development cost (through reduction of the number and size of newly developed elements). Flexibility is required to enable servicing of a range of missions, and simplicity leads to critical reductions in both development and operational costs.

Using these guiding principles, a new vehicle, named the Austral Launch Vehicle (ALV), is being developed. This vehicle is partially re-usable, with the upper stages being expendable. The first stage liquid propellant boosters are recovered by flying back to the launch site. These first stage modules represent the bulk of the vehicle cost, and are far easier to re-enter and recover than the upper stages. The ALV incorporates innovative features that address problems commonly experienced with flyback boosters, e.g. controllability, propellant selection, flight within a wide speed range and re-usability of hardware.

The ALV is currently under development as an advanced academic programme in Australia and South Africa. The project is being executed in four phases, with Phases 2 and 3 consisting of the development of flight vehicles of increasing complexity as precursors to the full-scale development in Phase 4.

The Phase 3 precursor vehicle has itself generated significant industry interest for use as a low cost small to medium satellite launch vehicle.