CAPSULE

The pressurised capsule has space for 6 crew and 1000 kg of cargo and has a cylindrical section accommodating the docking port. Life support systems can sustain the crew for 7 sols, providing oxygen, water supply, food supply, and waste tanks. Between the capsule and the aerothermal shell are 4 S-band antennas that ensure communication links with the ground and the node via 3 relay satellites.

ABORT

In case of abort in any of the 5 phases during ascent, rendezvous, and reentry, the nose cone will explosively detach from the vehicle and the abort engines will ignite the hydrogen peroxide and hydrazine hypergolic propellants. Parachutes are placed on top of the capsule, giving them a direct opening to deploy after nose cone separation. Drogue chutes are placed above the main parachutes, to help with their deployment.

LEGS

4 reusable and retractable landing legs are deployed, to support the static loads of launch, dynamic loads of landing, and to prevent tip-over from Martian wind.

ENGINES

9 LOX-Liquid Methane powered engines in an octaweb configuration. All engines are gimballed to provide additional pitch, yaw, and roll control. As a result of their symmetrical alignment, gimbal control, and maximum thrust of 310 kN with an Isp of 381 s, Charon is able to operate even with 4 engines out.

COMPUTER

The On Board Computer (OBC) uses the Phoenix flight computer, produced by L3Harris for the Vulcan rocket. The OBC operates 1 plus 3 extra flight computers for redundancy with a voting mechanism for fault tolerance.

CONTROL

Aerodynamic surfaces and controllable body flaps are also used as stabilisation, against the aerodynamic forces. The RCS, consisting of 33 thrusters, are positioned such that they provide 6 DoF control throughout flight. Furthermore, they provide additional stability during ascent and reentry in pitch, yaw, and roll. The RCS also provide control after abort.

CHASSIS

The chassis supports subsystem and component attachment to the vehicle, and carries the loads throughout the flight profile. It is refurbishable in-situ, being constructed from Aluminium 2024-T4. The propellant tanks, which comprise most of the rocket's volume, consist of the graphite composite IM-7 given the lack of need for reproducibility.

GROUND

Sulfur concrete launchpads are constructed within a crater away from the colony base for debris protection. Propellant and hydraulic fluids can be produced on Mars using water and carbon dioxide from the environment by means of the Sabatier reaction. For refurbishment, replacement components of aluminium alloys can be manufactured, and maintenance is performed by up to 40 person crew within a pressurised facility.