ABORT

Pressurized capsule, with 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 SYSTEM

5 abort phases during ascent, rendezvous, and reentry: the nose cone will explosively detach from the vehicle and the abort engines will ignite H2O2/NH4. Main and

MAIN ENGINES

9 LOX-Liquid Methane powered engines in an octaweb configuration. All engines are gimballed to provide additional pitch, yaw, and roll controlS. As a result of their symmetrical alignment, gimbal control, and maximum thrust of 310 kN, Charon is able to operate even with 4 engines out. Each engine has a closed expander cycle, with gaseous methane powering the single shaft turbopumps before injection. The chamber pressure of 200 bar and an expansion ratio of 141, a high performance is reached with an Isp of 381 s.

LANDING LEGS

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

CONTROL SURFACES & RCS

In order to control the aerodynamic moments during ascent and reentry, stabilising aerodynamic surfaces are placed at the nose, while controllable body flaps are placed at the base. The body flaps have a controllable angle of attack with respect to the vehicle, creating an adjustable force such that the aerodynamic moment is minimised. The remaining aerodynamic moment is counteracted by the RCS, which is made out of 33 thrusters. These are positioned such that the vehicles can be controlled in 6 degrees of freedom, with additional pitch control capabilities during reentry. Furthermore, they are designed such that the vehicle is controllable during and after abort.

FLIIGHT COMPUTERS

The On Board Computer (OBC) in the nose cone uses the Phoenix flight computer, produced by L3Harris for the Vulcan rocket. By Charon's deployment, the processor will have been upgraded to ESA's next generation GR740 microprocessor. The OBC operates 1 plus 3 extra flight computers in hot redundancy with a voting mechanism for fault tolerance. A further two flight computers are placed in the propulsive stage for control of the vehicle after abort.

TANKS & 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 volume, consists of the graphite composite IM-7 given the lack of need for reproducibility.

GROUND OPS

Sulfur concrete launchpads are constructed within a crater away from the colony base for debris protection. With the launchpad on a sloped hill, exhaust flames can be deflected without costly flame trench excavation. Propellant and hydraulic fluids can be produced on Mars using water electrolysis and the sabatier reaction. For refurbishment, replacement components of aluminium alloys can be manufactured, and maintenance is performed by a 20-40 person crew within a pressurised facility.