

Magnetic Field as a heat shield

This article describes a concept of artificial magnetic field generated by a magnetic field generator of the starship which intends to serve as a heat shield, allowing on safe re-entry of the Earth's atmosphere. This proposal of the solution intends to replace a standard heat shield based on silica, zircon, ablation shield or other material which absorbs heat. The magnetic field has capabilities of heat transfer and deflection away from the physical hull a heated plasma. Lorentz force exerts incoming atmospheric plasma, to keep it away from a starship hull.

Proposed active Magnetohydrodynamic (MHD) heat shield, is simulation on hypothetical starship with length 1 KM. The generator is being installed in nose of that starship. The artificial intelligence calculations are vary, but for that size of starship it has been calculated that MHD should have at least 1.6 Tesla consuming 1.0 GW electrical energy. In that scenario, the temperature of the hull of the starship would reach temperature around 307 Celcius degree, with atmosphere reentry speed 11 km/s and atmospheric density equal Earth's one.

Better results can be achieved by increasing a magnetic field strength up to 3.0 Teslas. This give overall better results – increased re-entry speed 16 km/s with atmospheric density 1.0. The hull in this case would have reach a temperature 464 Celcius degrees. Magnetic field generator would have consumed a 2.87 GW electrical energy.

The magnetic field itself is being generated by a superconducting toroidal coil array which runs electrical currents exceeding 100 000 Amperes. Active absorbing a heat generated by electrical circle would require a liquid helium cooling system. The generated magnetic field is working with refreshment time 1000 Hz ensuring that heated plasma won't get through a magnetic field.

Like any other simulation, this AI alternative to standard heat shield solution, should be verified by a specialists and it is a topic to further studies, but it shows that they are alternatives to standard raw absorbing heat materials which is possible to construct with current available to Human civilization tools.