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Pressure Profile of Titan, PPI/HASI Instrument for Huygens

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The Huygens entry probe descended through Titan's atmosphere and provided an excellent set of observations of the atmosphere and the surface of Titan. During the 2.5 hour descent the Huygens Atmospheric Structure Instrument (HASI) observed a comprehensive set of variables, including pressure, temperature, density and atmospheric electricity. The atmospheric pressure profile was recorded by the Pressure Profile Instrument (PPI), provided by Finnish Meteorological Institute (FMI).

The principal sections of the PPI were :

- Sensor boom extending out of the Huygens main body
- Kiel-probe with pitot tube at the end of the sensor boom
- Pressure tube connecting the Kiel-probe and the pressure sensors
- Pressure sensors and sensor electronics both inside the Huygens body

The decision to measure total pressure instead of static pressure and the design of the Kiel-probe were based on aerodynamic simulations. Simulations were performed for the airflow around the Huygens probe and in the vicinity of the tip of the sensor boom.

PPI uses pressure sensors with three different sensitivities to cover the full pressure range of Titan's atmosphere. The sensor technology is a heritage from a concept that has been used in earlier space and terrestrial applications.

The PPI started measurements at an altitude of 150 km, and produced about 28 bits of data per second. Measurements were continued beyond the time of surface impact, until Huygens ceased operations.

The first order scientific analysis of the PPI results has been performed. The PPI observations reveal the atmospheric pressure profile with the surface pressure of approximately 1.5 bar. The combined atmospheric pressure, temperature and density profiles were achieved by the combined effort of the whole HASI instrument. Swirling motions and turbulence of the Titan atmosphere is discussed.