TOSQAN Facility
[Test Station for Simulation and Qualification in Airborne Conditions]

The TOSQAN facility is used to reproduce thermohydraulic conditions simulating accident scenarios which may occur in a containment vessel and to assess the effect of mitigation measures, such as the internal spray system in the containment vessel. The experimental data acquired in this facility help to validate calculation software used for nuclear safety.

The TOSQAN experimental facility was commissioned in the early 2000s to study the main phenomena governing hydrogen distribution in the containment vessel of a reactor (condensation on the walls, mass and heat exchanges induced by the sump or by the vessel spray system) and the associated formation of flammable mixtures.

TOSQAN consists of a closed cylindrical tank (volume: 7 m³, height: 4 m, inner diameter: 1.5 m) into which steam and various non-radioactive and non-explosive gases and aerosols are injected in a controlled way to simulate the thermohydraulic conditions in a severe accident affecting a nuclear reactor (maximum design pressure: 7 bar – temperature in the vessel: 160°C). The facility is highly instrumented, with a wide variety of equipment, which required specific development work in collaboration with academic partners. This measurement equipment, for the most part based on innovative optical methods, is used for non-intrusive, local characterisation of multiphase flows composed of gaseous mixtures (air, steam and helium used to simulate the presence of hydrogen), water droplets and aerosols simulating fission products released by the core of the degraded reactor.

The research programmes conducted in TOSQAN are part of the studies carried out at IRSN on severe accidents that may affect nuclear reactors. Violent combustion of hydrogen occurring during reactor core degradation may lead to damage of the reactor containment or loss of its safety systems.